

Ground spiders (Gnaphosidae, Araneae) of Crete and adjacent areas of Greece. Taxonomy and distribution. II.

Maria CHATZAKI^{1,2}, Konrad THALER³ & Moysis MYLONAS^{1,2}

¹ Dept of Biology, University of Crete, 71100, Irakleio, Crete, Greece.

² Natural History Museum of the University of Crete, Knossou Av., 71409 Irakleio, Crete, Greece, Po BOX 2208.

³ Institut für Zoologie und Limnologie der Universität, Technikerstraße 25, A-6020 Innsbruck, Austria.

Ground spiders (Gnaphosidae, Araneae) of Crete and adjacent areas of Greece. Taxonomy and distribution. II.

- Further results of a comprehensive study of ground spiders (Gnaphosidae) from Crete and the surrounding islands Gavdos, Gavdopoula and Dia, the islands Antikithyra, Kos and Karpathos, and from Attiki and Peloponnisos on the Greek mainland, are presented. The taxonomy and distribution of 17 species, belonging to the genera *Anagraphis*, *Berinda*, *Berlandina*, *Gnaphosa*, *Nomis**a*, *Drassodes*, *Leptodrassus*, *Scotophaeus*, *Synaphosus*, *Cryptodrassus* and *Cesonia* are analyzed. Two species, *Nomis**a palaestina* and *Synaphosus palearcticus*, and the genus *Cesonia* are recorded for the first time in Europe. Four new species, *Berinda aegilia*, *Drassodes oreinos*, *Cryptodrassus creticus* and *Cesonia aspida* are described and three new combinations (*Anagraphis pallida* [transferred from *Talanites*], *Drassodes serraticus* [from *Mesikia*] and *Synaphosus trichopus* [from *Zelotes*]) are proposed. *Drassodes volidis* and *Scotophaeus subcorticis* are recognised as new synonyms of *D. lutescens* and *S. peninsularis*, respectively. The genus *Mesikia* Roewer is placed in the synonymy of *Drassodes*.

Key-words: Araneae - Gnaphosidae - Crete - Greece - taxonomy - distribution.

INTRODUCTION

Several authors in the past have pointed out the inadequate state of knowledge of the spiders of Greece and the adjacent areas of the East Mediterranean. Brignoli (1986), in his biogeographical analysis of the area, reported about 700 species and Deltsev (1999) mentioned 642 species for Greece. In his list, the latter also added 59 species for Crete. Bristowe (1935) and Hadjissarantos (1940) reported 30 and 32 gnaphosid species, respectively, from Greece. Until recently, 34 gnaphosid species were recorded from Crete. Most of these records have never been revised again. As far as spider diversity of Greece is concerned, this family has been severely underestimated in the literature and, no doubt, many species will be discovered in the future.

This paper is second in a series on the Gnaphosidae of Crete (see Chatzaki *et al.*, 2001), and it deals with some little known, as well as problematic, genera of the family. Seventeen species belonging to eleven genera (*Anagraphis*, *Berinda*, *Berlandina*, *Gnaphosa*, *Nomisia*, *Drassodes*, *Leptodrassus*, *Scotophaeus*, *Synaphosus*, *Cryptodrassus* and *Cesonina*) are analyzed taxonomically and presented here. This study also includes a revision of the collections of Roewer (1928) and Hadjissarantos (1940).

MATERIALS AND METHODS

The sampling strategy, exact localities and habitat type of each site are given in Chatzaki *et al.* (2002). In total, 59 sites were selected along the length of the island of Crete, 11 on the island group Gavdos – Gavdopoula and 3 on the island Dia (Fig. 1). Sampling sites cover Crete from north to south, west to east and along the altitudinal gradients of the three mountain massifs of the island, namely, Lefka Ori Mts., Psiloreitis Mts. and Lasithiotika Ori Mts. Most of the habitats selected on Crete are phrygana (plant communities that include dwarf, aromatic, thorny shrubs) and maquis. Few of the sites are pine forests or are situated close to permanent or temporary water reservoirs. New records from material collected from other areas of Greece and the Aegean islands (Fig. 2) have been added here, but are not shown on the distribution maps given for the species.

Material was collected using pitfall traps (12cm height, 9.5cm diameter). The killing preservative was ethylene glycole. At each site, 15-20 traps were set and changed in two-months intervals. In most cases, only material from the period of high activity of Gnaphosidae, e.g., late spring to early autumn (Chatzaki *et al.*, 1998; Chatzaki, 1998), has been analyzed and presented here.

The collection of material was financially supported by scientific projects of the EEC concerning biodiversity, i.e. TERRA, INTEREG II (ARCHIMED), or by the Ministry of Environment, Physical Planning and Public Works ("Gavdos, an island on the edge of Crete"), undertaken by the Natural History Museum of Crete (NHMC), and by the Biological Department of the University of Crete.

Identifications took place at the Natural History Museum of Crete and at the Zoological Institute of Innsbruck, Austria. Most of the material presented here is part of the Ph.D. thesis of the first author and is deposited at the NHMC. Material from the collection of Dr Hadjissarantos, deposited at the Zoological Museum of the Biological Department of Athens (ZMUA) and from the collection of Roewer, deposited at the Senckenberg Museum of Natural History, Frankfurt am Main, as well as the collection of the second author (KTh), has also been examined. Voucher specimens have been deposited at the Natural History Museum of Geneva (MHNG).

The following abbreviations are used in the text: Identification: reference used for the identification, TL: total length, PL: prosoma length, PW: prosoma width, OL: opisthosoma length, Cy: cymbium, Ta: tarsus, Me: metatarsus, Ti: tibia, Pa: patella, Fe: femur, d: dorsal, v: ventral, AME: anterior median eyes, ALE: anterior lateral eyes, PME: posterior median eyes, PLE: posterior lateral eyes. All measurements are given in mm. All drawings presented here are by the first author.

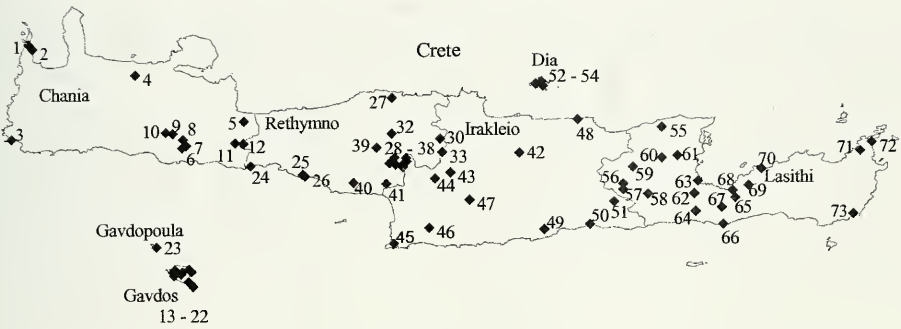


FIG. 1

Map of sampling sites on Crete and the surrounding islands Gavdos, Gavdopoula and Dia.

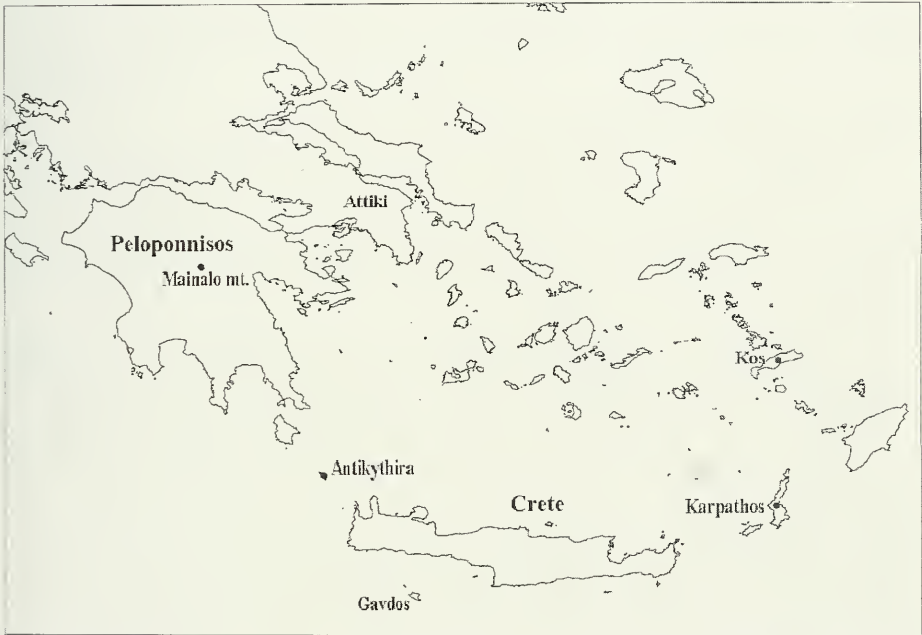


FIG. 2

Map of sampling sites on Attiki, Peloponnisos and Aegean islands.

RESULTS

Anagraphis pallida (Hadjissarantos, 1940) comb. n.

Figs 3-8

Talanites pallidus Hadjissarantos, 1940 (p. 79, Figs 23-25), ATTIKI: Pendeli – Dyonisos (type locality); Parnis – Phylli.

Material. ATTIKI: Pendeli – Dyonisos (1♂ holotype 1♀ paratype, 11/4/1937); Parnis – Phylli (1♂, 24/1/1937) (all in coll. Hadjissarantos, ZMUA). ANTIKYTHIRA: Potamos, 700m W: sparse phrygana on sandy soil close to the village, (1♀ *A. pallida* var.?, pitfall traps 27/3/2001 – 5/8/2001, leg. Chatzaki).

Taxonomy. This species was described by Hadjissarantos (1940) and, until now, has never been collected again. In general appearance it resembles *Talanites*. However, examination of the type revealed that the distinct characters of *Talanites* are absent: long and arched tibia, wide embolus and elongated median apophysis of the pedipalp, small hood of the epigyne. The revision of *Talanites* by Platnick & Ovtsharenko (1991) has revealed further misplacements of Eurasian gnaphosids in this genus. The distinct characters of both male and female genital organs of the Hadjissarantos specimen leave no doubt that this species belongs to *Anagraphis*. The similarity between the habitus of *Talanites* and *Anagraphis* was also stressed by Levy (1999a): „the two genera resemble each other in the proportional sizes and in the arrangement of their eyes,in the shape of the wide labium and cheliceral dentition, but differ distinctly in the shape of their genital characters“.

♂ ♀ Medium-sized, yellow spiders. Eyes round, posterior and anterior row almost straight. Labium wider than long. Chelicerae with 3 prolateral and 2 retrolateral teeth. Trochanters with a tiny notch. Opisthosoma oval, scutum absent in males.

♂ Pedipalp (Figs 3-4): Tibial apophysis short, filiform. Bulbus almost identical to that of *A. pallens* Simon, 1893. Retrolateral process (r) distinct. Sperm duct transverse, embolus long, filiform. Conductor long, transparent (C).

Epigyne (Figs 5, 7): Median depression V-shaped. Median part setose, with a sclerotized transverse rim. Epigyne of the female from Antikythira slightly different; the shape of the median depression (Fig. 7) is wider, and the median part is closer to the orifices. A dark mark, probably a mating plug, covers the lateral sides of this part, changing its appearance. Nevertheless we are inclined to place this female in *A. pallida*.

Vulva (Figs 6, 8): Receptacles globular with two chambers, like in *A. pallens* var. (see Chatzaki *et al.*, 2002, Fig. 7). The vulva of the specimen from Antikythira reveals that, in fact, the receptacles consist of a continuous coiled chamber (Fig. 8).

Comments. *A. pallida* is very much alike *A. pallens* Simon, 1893, already recorded from Crete (Chatzaki *et al.*, 2002). The two species are distinguished by the tibial apophysis of the male pedipalp and by the shape of the median part of the epigyne (for comparison see Chatzaki *et al.* 2002, Figs 2-5). This new combination adds a fifth species to the genus *Anagraphis*, in the wide region from the eastern Mediterranean to Afghanistan (other species are *A. pallens* and *A. pori* Levy, 1999 from Israel *A. pluridentata* Simon, 1897 from Syria and *A. maculosa* Denis, 1958 from Afghanistan) and is the second species to be reported from Greece.

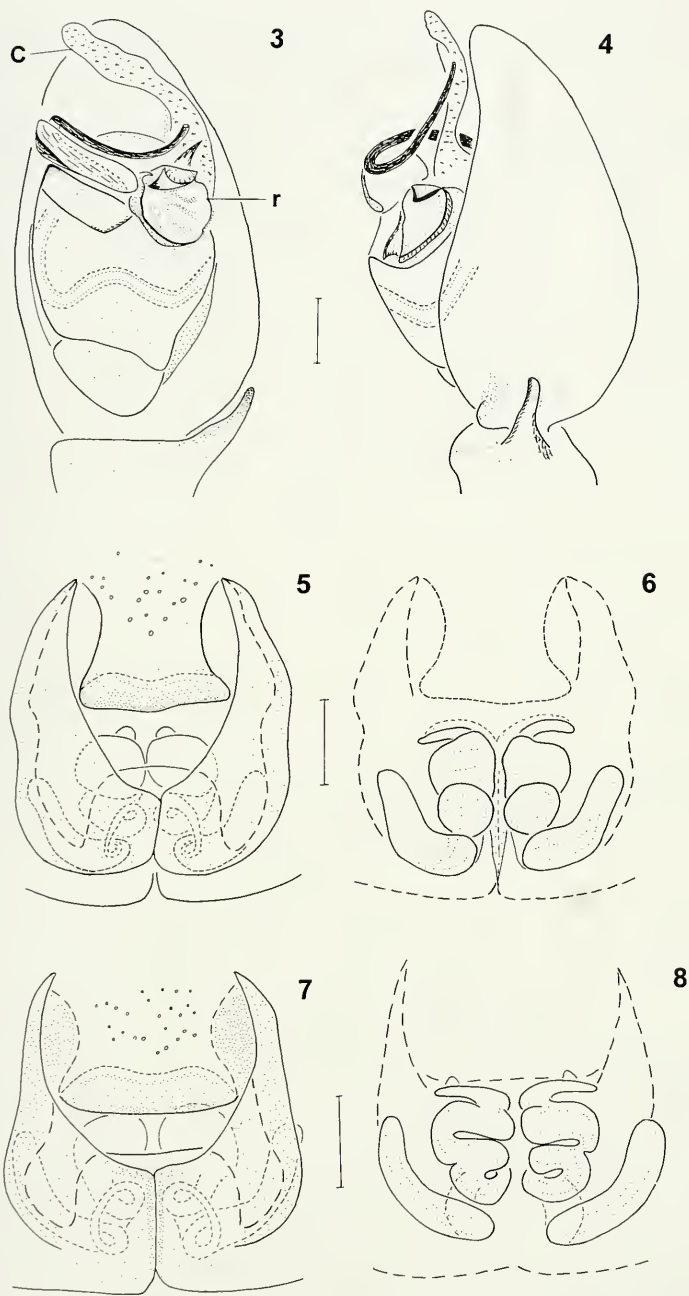
Distribution. Attiki, Antikythira (Greek endemic?). Considering our lack of arachnological knowledge on the surrounding area and the wide distribution of other species of this genus, we presume that *A. pallida* may well have a wider range of distribution.

***Berinda aegilia* Chatzaki sp. n.**

Figs 9-12

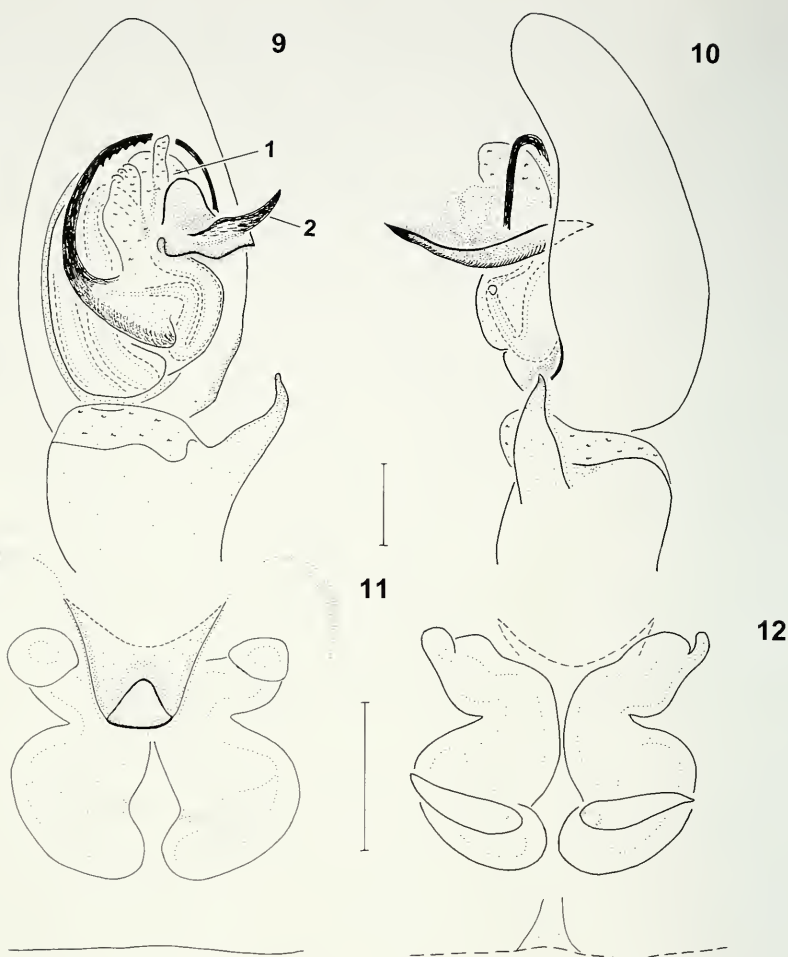
Etymology. The species name refers to the ancient name of the island Antikythira “Aegilia”; noun in apposition, hence invariable.

Material. Type material: ANTIKYTHIRA: Potamos, 700m W: sparse phrygana on sandy soil close to the village (pitfall traps 27/3/2001 – 5/8/2001, leg. Chatzaki, 1 ♂ holotype, 3 ♂ 1 ♀ paratypes [NHMC]; 2 ♂ 1 ♀ paratypes [MHNG]).



FIGS 3-8

Anagraphis pallida: 3, palp of ♂, ventral view; 4, palp of ♂, retrolateral view; 5, epigyne; 6, vulva; 7, *A. pallida* var.? epigyne; 8, *A. pallida* var.? vulva. Scale lines 0.1mm.



FIGS 9-12

Berinda aegilia sp. n.: 9, palp of ♂, ventral view; 10, palp of ♂, retrolateral view; 11, epigyne; 12, vulva. Scale lines 0.1mm.

Taxonomy. This is the third species to be placed in the genus *Berinda*, a genus established by Roewer (1928). The species shares a mixture of characters with the other species known in this peculiar genus. The general appearances of the pedipalp and the epigyne are close to those of *B. amabilis* Roewer, 1928, although details in the structures of the male genital organ resemble those of *B. ensigera* (O.P.-Cambridge, 1874) (see Chatzaki *et al.*, 2002).

Measurements ♂ (♀), n = 6(2): TL: 3.8-4.8 (4.2-5.1), PL: 1.8-2.3 (1.9-2.1), PW: 1.2-1.7 (1.3-1.5), PL/PW: 1.3-1.5 (1.4), OL: 1.7-2.2 (1.9-2.6).

♂ ♀ Medium-sized, brown spiders, habitus similar to that of *Zelotes*. Eyes round, with anterior row slightly recurved, posterior row slightly procurved or straight. Preening combs present on Me III and IV, like in its congeners.

Legs: Ta I-II and Me I-II with scopula. Ta III-IV with dense stripe of small spines. Me III-IV with apical preening comb as in *Zelotes*. Spination: Fe: I-II d 3 ; III d 7; IV d 4. Pa: I-II, IV - ; III p 1, r 1. Ti: I-II - ; III-IV spinose. Me: I v 2; II v 4; III-IV spinose.

♂ Pedipalp (Figs 9-10): Fe with 3 dorsal spines. Pa without an apophysis. Tibial apophysis relatively small, with a curved tip, set well apart from the cymbium. Cymbium oval, without proximal extensions (found in both *B. amabilis* and in *B. ensigera*), but with a hairless, slightly excavated retrolateral edge. Tegulum sclerotized, with distinct conductor originating from a membranous anterior bladder (1) and projecting ventrally into a strongly sclerotized claw (2). Embolus long, filiform, starting at proximal base of the tegulum and bearing some denticles at midlength.

Epigyne (Fig. 11): Anterior margins slightly sclerotized at the sides, continuing to a rectangular anterior hood similar to that of *B. amabilis*. Introductory orifices situated laterally.

Vulva (Fig. 12): Introductory ducts short, with glandular heads in front, leading to coiled, oval spermathecae.

Distribution. Antikythira.

Berlandina plumalis (O.P.- Cambridge, 1872)

Figs 13-16, 69

Identification: Levy (1995).

Material. CRETE: CHANIA: Site 13 (a 25 ♂♂ 10 ♀♀; b 2 ♂♂; c 28 ♂♂ 3 ♀♀; d 15 ♂♂ 11 ♀♀); Site 14 (a 6 ♂♂ 16 ♀♀; b 1 ♀; c 63 ♂♂ 13 ♀♀; d 20 ♂♂ 14 ♀♀); Site 15 (a 1 ♂ 1 ♀; c 8 ♂♂; d 1 ♂ 1 ♀); Site 16 (c 1 ♂; d 2 ♀♀); Site 18 (a 1 ♀; c 24 ♂♂ 10 ♀♀; d 4 ♀♀); Site 19 (a 3 ♂♂ 7 ♀♀; c 42 ♂♂ 5 ♀♀; d 19 ♂♂ 3 ♀♀); Site 20 (a 7 ♂♂; b 7 ♂♂ 4 ♀♀ [MHNG]); Site 21 (a 2 ♀♀; b 1 ♂); Site 22 (a 9 ♂♂ 1 ♀; b 4 ♀♀) (all leg. Paragamian). IRAKLEIO: Site 48 (a 6 ♂♂ 1 ♀) (leg. Trichas).

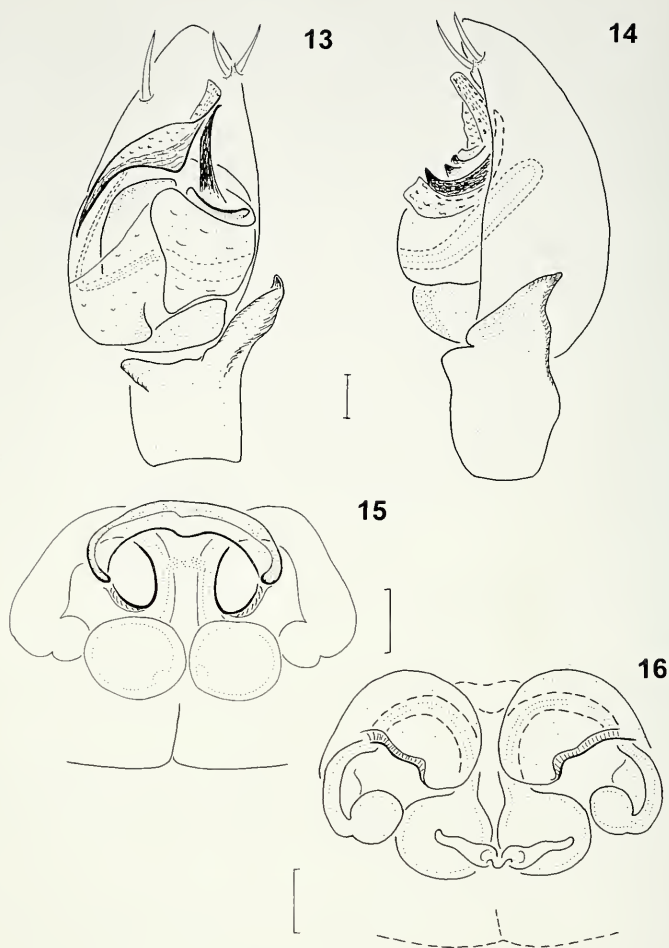
Taxonomy. ♂ ♀: Large, yellow spiders with brown markings along prosoma and opisthosoma, very similar to *Pterotricha lentiginosa* (C. L. Koch, 1837), making them almost indistinguishable in the field. The species can be easily recognised from species of other genera and from its congeners by the genital organs.

♂ Pedipalp (Figs 13-14): Tibial apophysis with broad base, curling and tapering towards its end. Tegulum voluminous, with long and slender retrolateral apophysis, ending in a curved tip (probably corresponding to the retinaculum of *Haplodrassus*). Embolus prolateral, strong, with sclerotized rims and a distal curl.

Epigyne (Fig. 15): Central depression oval, deep, divided by a median septum with sclerotized rims separating the wide, introductory orifices.

Vulva (Fig. 16): Introductory ducts funnel-like, first running to lateral/posterior side, then turning and leading to the spermathecae. At the turning point, a globular gland is attached, while at the level of the introductory orifices the two channels apparently overlap. Spermathecae globular.

Ecology. *B. plumalis* apparently prefers dry habitats, such as sand dunes and phrygana, as previously reported by Levy (1995). The only exception occurs at Site



FIGS 13-16

Berlandina plumalis: 13, palp of ♂, ventral view; 14, palp of ♂, retrolateral view; 15, epigyne; 16, vulva. Scale lines 0.1mm.

19, which stays damp throughout the year. *B. plumalis* has been collected at many sites on Gavdos (Fig. 69), where it is the dominant ground spider, but it has been collected at only one locality on Crete (Site 48). This observation is in contrast to its known, wide range of distribution, which suggests a high dispersal capacity. The scarcity of *B. plumalis* on Crete is probably due to competitive interaction with *P. lentiginosa*, which is widespread on Crete and adjacent islands, but absent on Gavdos. *P. lentiginosa* is also absent at the only locality on Crete, where *B. plumalis* was collected, see Chatzaki *et al.* (2002). Adult males and females are present during the whole year, with a peak of activity in late spring and summer.

Distribution. West Africa to China.

***Gnaphosa dolosa* Herman, 1879**

Figs 17-18, 69

Identification: Ovtsharenko *et al.* (1992), ? Levy (1995).*Material*. CRETE: CHANIA: Site 13 (b 1 ♀) (leg. Paragamian).

Taxonomy. Only one female of this species was collected on Gavdos (Fig. 69). It is the only *Gnaphosa* collected on the island, and has not been found on Crete. Distinctive characters are the shape of the median hood and the sclerotized pouches of the epigyne, forming in their median part the introductory orifices. Spermathecae globular with simple, curved introductory ducts, laterally directed.

The taxonomy of this species is not yet clear. Levy (1995) maintains *G. barroisi* Simon, 1892 as a distinct species, whilst earlier it was placed in synonymy with *G. dolosa* by Ovtsharenko *et al.* (1992). The female genitalia of the Gavdos specimen (Figs 17-18) strongly resemble the drawings of both articles (Levy, 1995 vs. Ovtsharenko *et al.*, 1992). When males become available, eventual differences in the embolus and the retrolateral apophysis of the male palp should be investigated.

Distribution. Palearctic, mediterranean zone.

***Nomisia palaestina* (O.P.-Cambridge, 1872)**

Figs 19-20

Identification: Levy (1995).

Material. KOS: Kefalos – Ag.Ioannis, 1 km S, phrygana and adjacent pine forest, (1 ♀, pitfall traps 26/6/2001 – 9/9/2001, leg. Chatzaki). PELOPONNISOS: Mainalo Mt., alpine phrygana, (2 ♀♀, pitfall traps 9/7/1997 – 12/10/1997, leg. Anastasiou).

Taxonomy. Only two females of this species were collected in pitfall traps on the island of Kos and on Peloponnisos. The epigynal median depression of this species widens laterally, exposing the parallel channels of the introductory ducts (Fig. 19). Spermathecae oval and robust (Fig. 20).

Distribution. Syria, Palestine; (first record for Europe).

***Nomisia* sp. n. ?**

Figs 21-22, 69

Material. CRETE: CHANIA: Site 3 (a 1 ♀).*Taxonomy*. Measurements ♀: TL: 5.8, PL: 2.3, PW: 1.8, OL: 3, PL/PW: 1.27.

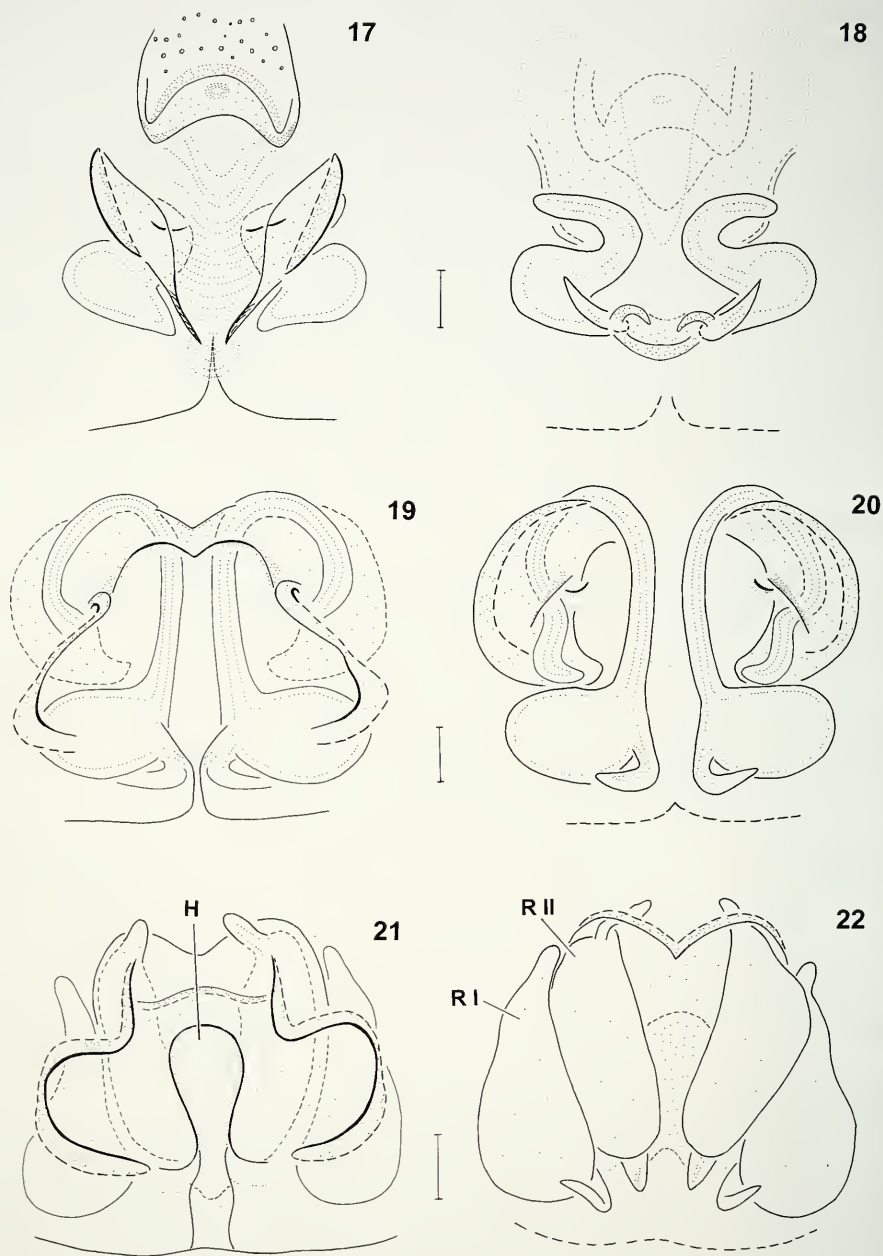
♀ Small-sized, brown spider with habitus similar to those of its congeners.

Epigyne (Fig. 21): Median depression with widely expanded, sclerotized lateral rims, centre with characteristic median cleft (H), leading to a central cavity.

Vulva (Fig. 22): Receptacles strongly sclerotized, divided into two large oval chambers (RI and RII), each with a glandular head anteriorly.

Comments. Following keys to the genera of Gnaphosinae (Simon, 1914 and Levy, 1995), this species keys out to *Nomisia*. However the genital characters (the central cleft and the duplicated receptacles) are very distinct and differ from those of any other species of the genus (see Levy, 1995; Denis, 1937; Dalmas, 1921; Roewer, 1961). Several males have been described from the adjacent areas (see Platnick, 2001), the females of which are unknown. This female could therefore belong to one of them. Unfortunately no male has been found which could clarify the taxonomic status of this singular female. Until further material is collected, we are reluctant to establish a new *Nomisia* species.

Distribution. Crete (known only from one locality, Fig. 69).



FIGS 17-22

Gnaphosa dolosa: 17-18. *Nomisia palaestina*: 19-20. *Nomisia* sp.n. ? : 21-22. Epigyne (17, 19, 21), vulva (18, 20, 22). Scale lines 0.1mm.

Drassodes lutescens (L. Koch, 1839)

Figs 23-26, 70

Drassodes validis Roewer, 1928 (p. 99, Fig. 3), ATTIKI: Athens, Akropolis (type locality); Pendeliko. **Syn. n.**

Identification: Simon (1914), Kulczynski (1911).

Material. CRETE: CHANIA: Site 1 (a 1 ♂ 1 ♀); Site 2 (a 2 ♂♂ 2 ♀♀; f 8 ♂♂); Site 3 (a 2 ♂♂ 3 ♀♀ [MHNG]); e 3 ♂♂ 2 ♀♀; f 1 ♀); Site 5 (a 3 ♂♂ 6 ♀♀; b 1 ♂ 4 ♀♀; c 1 ♀); Site 6 (i 1 ♂; j 1 ♂ 1 ♀) (all leg. Lymberakis); Site 13 (b 6 ♂♂ 2 ♀♀; c 4 ♂♂); Site 14 (a 7 ♂♂; b 13 ♂♂ 4 ♀♀; c 7 ♀♀; d 2 ♀♀); Site 15 (b 1 ♀; c 1 ♂ 1 ♀; d 4 ♀♀); Site 18 (a 2 ♂♂; b 12 ♂♂ 7 ♀♀; c 14 ♀♀; d 1 ♀); Site 19 (d 1 ♀); Site 20 (a 2 ♀♀); Site 21 (b 2 ♂♂ 2 ♀♀; c 1 ♀); Site 22 (a 3 ♀♀); Site 23 (a 3 ♂♂; b 17 ♂♂ 1 ♀; c 18 ♀♀) (all leg. Paragamian); RETHYMNO: Site 25 (a 1 ♂) (leg. Lymberakis); Site 27 (a 2 ♂♂ 1 ♀; b 1 ♀; f 8 ♂♂); Site 34 (e 2 ♀♀) (all leg. Chatzaki); Site 30 (a 1 ♂) (leg. Trichas); Site 28 (a 2 ♂♂; b 1 ♀); Site 29 (a 6 ♂♂ 2 ♀♀; b 8 ♀♀); Site 32 (a 1 ♂ 3 ♀♀); Site 40 (b 2 ♂♂); Site 41 (a 1 ♂; b 1 ♀) (all leg. Nikolakakis); IRAKLEIO: Site 42 (e 13 ♂♂ 1 ♀; f 10 ♂♂ 4 ♀♀; g 13 ♀♀) (all leg. Chatzaki); Site 44 (a 2 ♂♂ 1 ♀); Site 45 (a 1 ♂; b 1 ♀); Site 47 (a 1 ♂; b 1 ♀; e 1 ♂); Site 52 (c 1 ♂); Site 53 (a 1 ♀) (all leg. Nikolakakis); Site 46 (a 1 ♂ 1 ♀); Site 49 (a 28 ♂♂ 1 ♀; b 1 ♂ 4 ♀♀); Site 50 (c 2 ♀♀); Site 51 (a 7 ♂♂ 6 ♀♀; b 1 ♀) (all leg. Papadimitrakis); Site 48 (a 2 ♂♂ 4 ♀♀) (leg. Trichas); LASITHI: Site 56 (d 1 ♂ 1 ♀); Site 73 (a 1 ♀) (all leg. Chatzaki); Site 58 (a 2 ♂♂ 2 ♀♀; b 1 ♀); Site 62 (b 1 ♀); Site 64 (d 1 ♂; a 1 ♂) (all leg. Papadimitrakis); Site 63 (a 1 ♂); Site 71 (a 18 ♂♂ 7 ♀♀; b 3 ♀♀) (all leg. Stathi); Site 66 (a 1 ♂ 1 ♀); Site 67 (a 1 ♂ 5 ♀♀); Site 70 (a 13 ♂♂ 9 ♀♀; b 1 ♀); Site 72 (b 1 ♀) (all leg. Trichas).

Comparative material examined: *D. validis*: 1 ♀ holotype, SMF: CR 579/29; Pendeliko (1 ♀, SMF: CR 580/30).

Taxonomy. Yellow spiders of medium size. They are characterized by the absence of a tibial apophysis and by a relatively long embolus, situated at the pro-lateral side of the palpal organ (Figs 23-24). Epigyne narrow, ca. 2.3 times broader than long, with a tongue-like median structure, almost straight and lateral pouches hardly curved (Figs 25-26).

In our view, the female holotype of *D. validis* Roewer, 1928 corresponds fully to *D. lutescens*, and therefore, the new synonymy is proposed.

Ecology. *D. lutescens* is the most widespread species of this genus on Crete. It is the only large *Drassodes* found on Dia and Gavdos – Gavdopoula. Apparently it prefers phryganic habitats of low elevations (Fig. 70), whereas other species of the genus seem to become more numerous at altitudes higher than 800m. The highest point where *D. lutescens* has been found is at 1450m (Lasithi, Limnakaro plateau, Site 56). Adults may be found through the whole year, but the peak of activity is in spring.

Distribution. Mediterranean to central Asia.

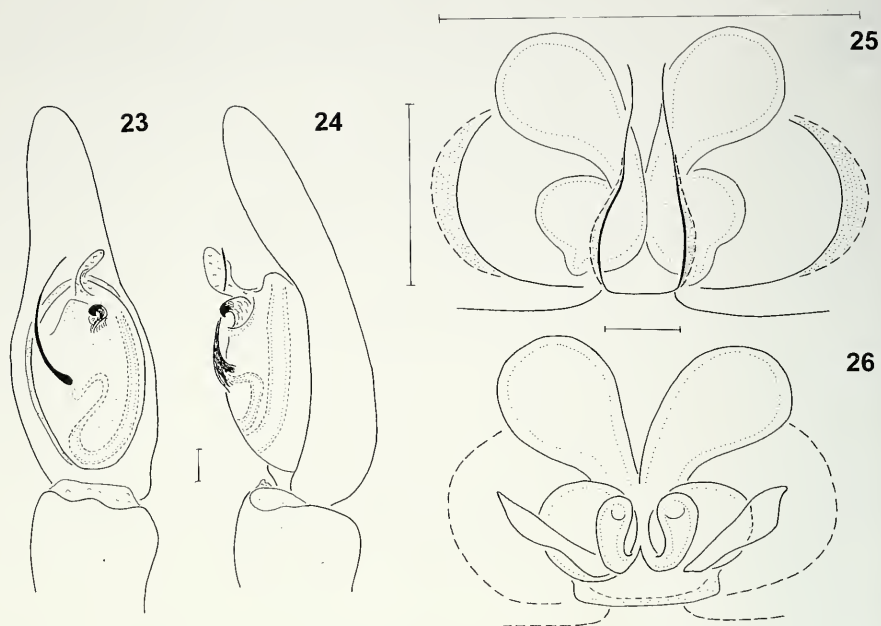
Drassodes lapidosus (Walckenaer, 1802)

Figs 27-28, 34-35, 70

Identification: Grimm (1985, p. 116, Figs. 115-117, 134-135).

Material. CRETE: CHANIA: Site 4 (a 1 ♂; b 1 ♀); Site 5 (a 2 ♂♂); Site 6 (e 2 ♂♂ 1 ♀) (all leg. Lymberakis); RETHYMNO: Site 29 (b 1 ♀); Site 32 (a 1 ♂ 3 ♀♀); Site 39 (a 1 ♀; b 1 ♂ 1 ♀) (all leg. Nikolakakis); IRAKLEIO: Site 42 (e 3 ♂♂ 2 ♀♀; f 1 ♀; g 2 ♀♀) (all leg. Chatzaki); Site 43 (a 22 ♂♂ 6 ♀♀; b 23 ♂♂ 44 ♀♀; b 4 ♂♂ 4 ♀♀ [MHNG]); Site 49 (a 3 ♂♂; b 3 ♂♂ 1 ♀); Site 51 (a 31 ♂♂ 33 ♀♀; b 9 ♀♀) (all leg. Papadimitrakis); LASITHI: Site 56 (a 3 ♂♂ 2 ♀♀) (leg. Chatzaki); Site 58 (a 1 ♂ 2 ♀♀; b 1 ♀) (all leg. Papadimitrakis); Site 59 (a 4 ♀♀; c 1 ♂ 1 ♀); Site 61 (b 1 ♂ 1 ♀); Site 67 (a 2 ♂♂ 3 ♀♀) (all leg. Trichas).

Taxonomy. The size, colour and cheliceral dentition of males of *D. lapidosus* vary greatly in mid-Europe, as reported by Grimm (1985, Figs 138 a-e). Based on this



FIGS 23-26

Drassodes lutescens: 23, palp of ♂, ventral view; 24, palp of ♂, retrolateral view; 25, epigyne; 26, vulva. Scale lines 0.1mm.

variation and a difference in the length of the tip of the cymbium, Roberts (1985) separates two species, *D. lapidosus* and *D. cupreus* (Blackwall, 1834), while Grimm considers these differences as intraspecific variation of a single species, *D. lapidosus*. Nevertheless there are further arguments, based on ecological surveys, for regarding these two forms as different species (Thaler, 1981).

Also in Crete, the cheliceral dentition of males is variable (Table 1), as well as their size (variation from 0.7cm to 1.5cm total length) and colour (from dark brown in large specimens to yellow in smaller ones). The *lapidosus* type outnumbers that of *cupreus*, while the majority of individuals are intermediate, irrespective of body size. Moreover, the tip of the cymbium is constantly long, as in *D. lapidosus* (sensu Roberts). It seems rather improbable that a further large *Drassodes* occurs at these sites. Therefore we are inclined to accept these morphological differences as intraspecific variation of *D. lapidosus* within Cretan populations.

♂ Pedipalp (Figs 27-28): Genital characters constant. Tibial apophysis short, with tapering tip. Retinaculum small. Embolus short and thin.

Epigyne (Fig. 34): Epigyne with wide lateral pouches, touching the epigastric furrow. Introductory orifices in the median part of the epigyne, developed as semi-circular, retrolaterally directed, sclerotizations.

Vulva (Fig. 35): Spermathecae reaching beyond lateral pouches.

Ecology. *D. lapidosus* is not very common on Crete (Fig. 70). It is mostly confined to the mountainous zone (from 800m to about 1500m), its highest record is at 1450m. It has been found only scarcely at lower elevations, where it occurs along with *D. lutescens*. The largest populations have been found on the mainland, on the southeastern slopes of Mt. Psiloreitis and on the southwestern slopes of Lasithiotika Mts. Adults are found from April to late summer.

Distribution. Palaearctic.

***Drassodes oreinos* Chatzaki sp. n.**

Figs 29-31, 38-39, 71

Etymology. The name of this species is derived from the altitudinal zone in which it has been collected on Crete, from 1200m to 2400m, hence „*oreinos*“ (= mountainous in modern Greek). The ending of the species name is invariable.

Material. Type material: Site 37d (Psiloreitis Mt., Lochria, 1950m) (1 ♂ holotype, 15 ♀♀ paratypes [NHMC]; 2 ♂♂ 2 ♀♀ paratypes [MHNG]).

CRETE: CHANIA: Site 7 (g 3 ♀♀); Site 8 (a 1 ♂ 1 ♀; b 1 ♀; c 1 ♂; f 1 ♀; h 5 ♂♂ 1 ♀; i 2 ♂♂; j 2 ♂♂ 2 ♀♀; k 2 ♀♀); Site 9 (a 5 ♂♂ 24 ♀♀; b 15 ♂♂ 24 ♀♀; c 10 ♀♀; d 3 ♂♂ 49 ♀♀; e 9 ♂♂ 16 ♀♀; f 34 ♂♂ 10 ♀♀; g 11 ♀♀); Site 10 (a 1 ♂ 1 ♀) (all leg. Lymberakis); RETHYMNO: Site 34 (a 5 ♀♀; b 14 ♂♂; c 8 ♂♂ 3 ♀♀; d 1 ♂ 4 ♀♀); Site 37 (a 1 ♂ 18 ♀♀; b 14 ♂♂ 7 ♀♀; c 27 ♂♂ 22 ♀♀; e 17 ♀♀); Site 38 (a 10 ♂♂ 11 ♀♀; b 1 ♂ 4 ♀♀) (all leg. Chatzaki); Site 35 (a 9 ♂♂ 1 ♀); Site 36 (a 1 ♀) (all leg. Trichas); IRAKLEIO: Site 51 (a 2 ♀♀; b 10 ♂♂) (leg. Papadimitrakis); LASITHI: Site 56 (b 3 ♂♂ 3 ♀♀; c 1 ♂); Site 57 (a 1 ♂ 10 ♀♀; b 28 ♂♂; c 5 ♂♂ 2 ♀♀; d 7 ♀♀) (all leg. Chatzaki).

Taxonomy. Measurements ♂ (♀), n = 7 (7): TL: 5.5-13.5 (10-13.5), PL: 3.7-5.6 (4-4.9), PW: 2.6-3.8 (2.5-3.7), OL: 4-6.5 (5.4-8.3), PL/PW: 1.42-1.47 (1.32-1.6) Cy: 1-1.5.

♂♀ : Large, brown spiders with habitus similar to that of *D. lapidosus*. Eye pattern as in other *Drassodes*. Chelicerae not elongated, dentition constant, with posterior teeth placed close together (Fig. 30).

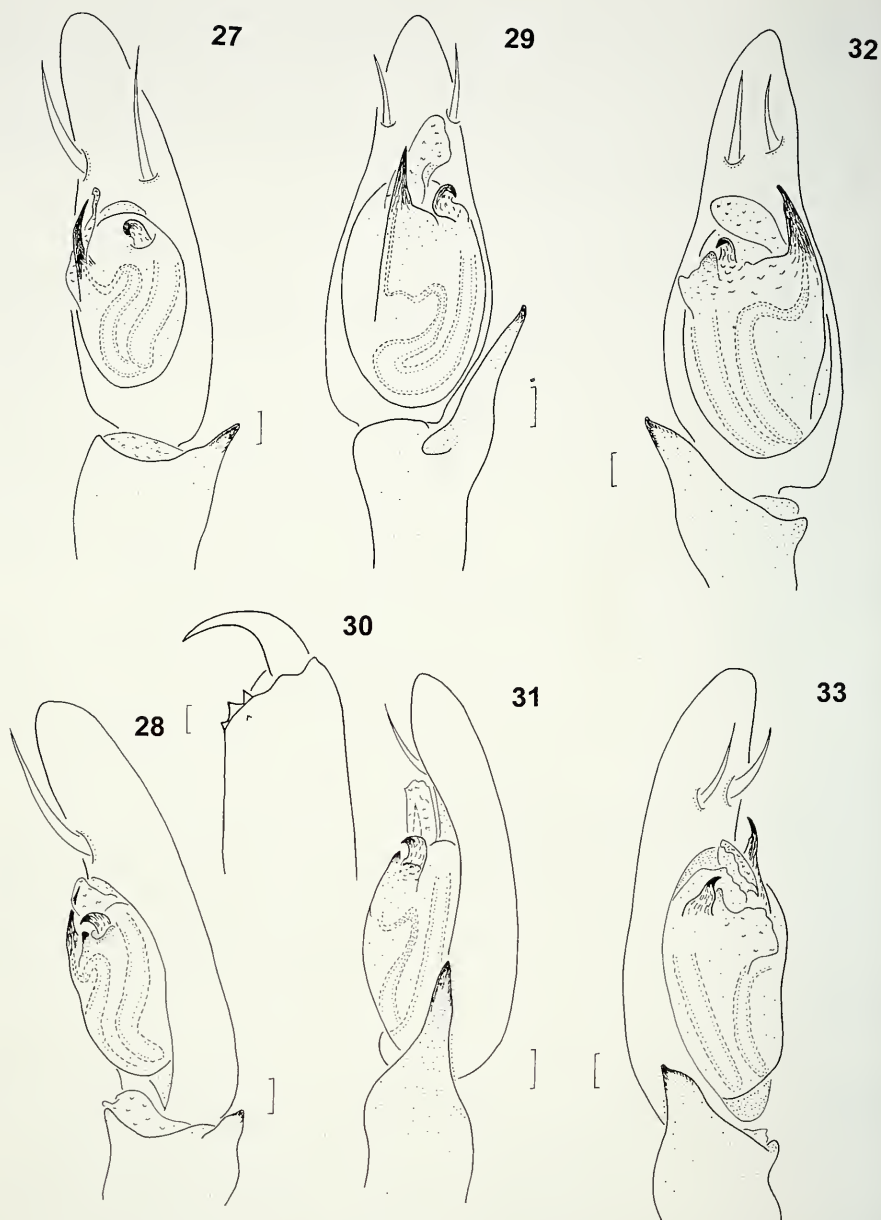
Legs: Ta I-IV and Me I-II with scopula hairs ventrally. Spination: Fe : I-II d 3-4; III-IV d 7. Pa : - . Ti : I-II v 4-5; III-IV spinose. Me : I v 2; II v 2-3; III-IV spinose.

♂ Pedipalp (Figs 29, 31): Tibial apophysis robust, straight and tapering, reaching almost 1/3 length of the palpal organ. Sperm duct going from retrolateral side of tegulum towards the prolateral side, there turning to the centre and entering the strong, straight and spine-shaped embolus. Retinaculum at retrolateral edge of tegulum.

Epigyne (Fig. 38): Lateral pouches narrower than in *D. lapidosus*, usually placed in the anterior half of the epigyne and not reaching the epigastric furrow. Median sclerotized rims almost parallel and wider apart than in *D. lutescens*.

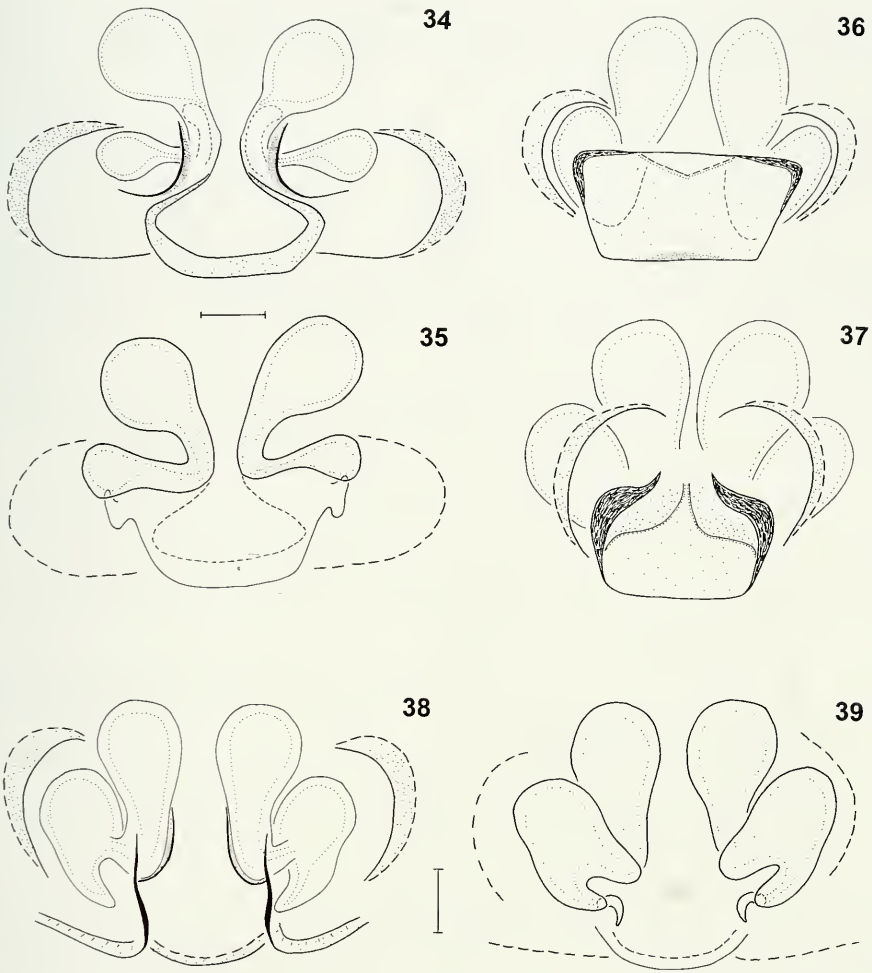
Vulva (Fig. 39): Spermathecae almost straight, not curved as in *D. lapidosus*.

Comments. We failed to identify this species, despite a thorough search of the literature. It is therefore established as new. As recognised from the revision of the types, *D. omalosis* Roewer, 1928 (SMF: CR 578/28, 1 ♂ 1 ♀) is clearly different from the new species. Differences are found in the size and shape of the tibial apophysis, in a retrolateral angle of the tegulum, which is present in *D. omalosis* but absent in *D. oreinos* sp. n., and in the embolus, which is less pointed in *D. omalosis* (Figs 32-33). Females differ clearly, mainly because of a median plate, present in *D. omalosis* (Fig. 36), which makes the new species resemble more closely *D. pubescens* (Thorell,



FIGS 27-33

Drassodes lapidosus: 27-28. *D. oreinos* sp. n.: 29-31. *D. omalosis*: 32-33. Palp of ♂ ventral view (27, 29, 32) and retrolateral view (28, 31, 33); ♂ chelicerae (30). Scale lines 0.1mm.



FIGS 34-39

Drassodes lapidosus: 34-35. *D. omalosis*: 36. *D. pubescens*: 37. *D. oreinos* sp. n.: 38-39. Epigyne (34, 36, 37, 38), vulva (35, 39). Scale lines 0.1mm.

1856). We compared females of *D. oreinos* sp. n. with *D. pubescens* females from central-Europe (Fig. 37) and concluded that they are different too. Male and female types of *D. omalosis* are assumed to belong to the same species, since they were collected from the same retreat. Also, specimens recently collected from Mt. Mainalo, Peloponnisos, confirm this opinion.

Ecology. This species is found only at high altitudes of the Cretan mountains (Fig.71). The lowest record is at 1200m and its abundance increases considerably from 1650m upwards, where it remains the only representative of the genus. In the spider communities present at the high mountains of Crete, two species are highly

dominant, *D. oreinos* sp. n. and *Gnaphosa bithynica* (Kulczynski, 1903). Adults are present throughout the whole year, with a peak of activity in late summer.

Distribution. Crete (endemic?).

***Drassodes serratichelis* (Roewer, 1928) comb. n.**

Figs 40-43, 72

Mesklia serratichelis Roewer, 1928 (p. 112, Figs 19-21), CRETE: Meskla, under a *Platanus*, (type locality).

Material. CRETE: CHANIA: Site 2 (a 1 ♀); Site 8 (f 1 ♂) (all leg. Lymberakis); Site 15 (d 2 ♂♂); Site 18 (a 1 ♀; c 1 ♀; d 2 ♀♀); Site 20 (b 1 ♂); Site 23 (c 3 ♂♂ 2 ♀♀) (all leg. Paragamian); RETHYMNO: Site 25 (a 1 ♀ [MHNG]) (leg. Lymberakis); Site 29 (a 1 ♀); Site 32 (a 2 ♂♂); Site 41 (a 1 ♂ [MHNG]) (all leg. Nikolakakis); IRAKLEIO: Site 52 (b 1 ♀); Site 54 (b 1 ♂) (all leg. Nikolakakis); LASITHI: Site 63 (b 1 ♀) (leg. Stathi); Site 68 (a 1 ♀) (leg. Papadimitrakis); Site 70 (a 1 ♀) (leg. Trichas).

KOS: Kefalos – Ag. Ioannis, 1 km S, phrygana and adjacent pine forest, (1 ♀, pitfall traps 26/6/2001 – 9/9/2001, leg. Chatzaki). KARPATOS: Pyles – Volada, 1km E, phrygana on an earlier burnt field, (1 ♂, pitfall traps 12/5/2001 – 23/8/2001, leg. Chatzaki).

Comparative material examined: *M. serratichelis*: 1 ♀ holotype, SMF: CR 613/63.

Taxonomy. Very small yellow spiders of about 3-5mm total length. The notch on the trochanter, the eye pattern and the characters of the genital organs of this species conform to those of the genus *Drassodes*. Therefore a new combination is proposed here. As *D. serratichelis* is the type species of *Mesklia*, this genus is placed in the synonymy of *Drassodes*.

♂ Pedipalp (Figs 40-41): Tibial apophysis absent. Sperm duct following the walls of the tegulum from the retro- to the prolateral side. Embolus slender, guided by a transparent lamella (l). Retinaculum tiny.

Epigyne (Fig. 42): Lateral margins small, forming retrolateral pouches. Median rims almost straight, retrolaterally directed.

Vulva (Fig. 43): Receptacles two-lobed, with an oval and a globular chamber, as in other *Drassodes*.

Ecology. *D. serratichelis* is not very common on Crete (Fig. 72). However, it is widespread on the island and on the surrounding islands examined (Gavdos, Gavdopoula, Dia, Karpathos, Kos). It reaches altitudes of 1650m, but occurs also on phrygana of the lowlands. Adults are found mainly in the summer.

Distribution. Crete, Kos, Karpathos (Greek endemic?).

***Leptodrassus pupa* Dalmas, 1919**

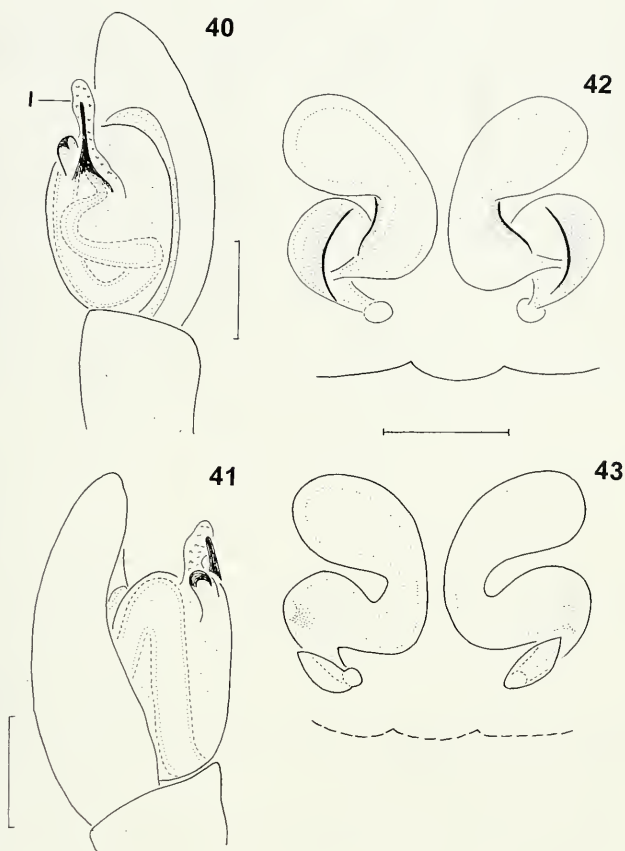
Figs 44-45, 72

Identification: Levy 1999b (p. 447, Figs 38-39).

Material. CRETE: IRAKLEIO: Site 47 (b 1 ♂) (leg. Nikolakakis).

Taxonomy. The identity of this species is not without doubt. Females collected at other localities on Crete (Chatzaki *et al.*, 2002) fit well the drawing of *L. pupa* given in Levy (1999b, Fig. 40). However it is difficult to fully match the characters of the male. The tibial apophysis (Figs 44-45) seems to be the same as in *L. pupa*, but the apophyses of the tegulum apparently differ. As we hesitate to accept the presence of a fifth *Leptodrassus* on Crete, we reluctantly place this male in *L. pupa*.

Distribution. Egypt, Crete.



FIGS 40-43

Drassodes serratichelis: 40, palp of ♂, ventral view; 41, palp of ♂, retrolateral view; 42, epigyne; 43, vulva. Scale lines 0.1mm.

Scotophaeus scutulatus (L. Koch, 1866)

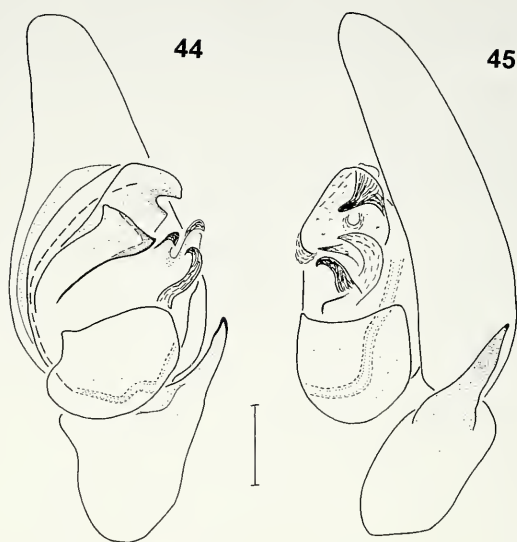
Figs 46-47, 73

Identification: Grimm (1985, p. 179, Figs 201 & 210-212).

Material. CRETE: CHANIA: Site 22 (b 1 ♀) (leg. Paragamian); LASITHI: Site 58 (a 1 ♀) (leg. Papadimitrakis).

Comparative material examined: *S. scutulatus*: AUSTRIA: Innsbruck (1♂ 1♀, Aug. 1963, Col. KTh); GREECE: Attiki, Kato Souli (1♂ 1♀, Col. Hadjissarantos, ZMUA). *S. blackwalli*: ITALY: Bezzecca (1♂, Sept. 1963, Col. KTh); Zaran (1♀, Aug. 1966, Col. KTh); GREECE: Ipeiros, Ioannina lake (1♂, Col. Hadjissarantos, ZMUA).

Taxonomy. The characters of the epigyne of our specimens (Figs 46-47) fit well the description of Grimm (1985) and with comparative material from other localities in Greece and from Austria. The species probably occurs also in Israel. The figures given by Levy (1999b, p. 439, Figs 22-23) for a *S. blackwalli* female, closely resemble the epigyne and vulva of *S. scutulatus* (see Grimm, 1985, p. 181, Figs 211-



FIGS 44-45

Leptodrassus pupa: 44, palp of ♂, ventral view; 45, palp of ♂, retrolateral view. Scale lines 0.1mm.

212). On the other hand, the male characterized by him as *S. blackwalli*, clearly resembles this species (see embolus and tibial apophysis in Levy, 1999b, Figs 20-21 and Grimm, 1985, p. 173, Figs 199 a-b).

Distribution. Cosmopolitan. GREECE: Attiki: Kato Souli; Pikermi; Vouliagmeni; Parnitha-Palaiochori (Hadjissarantos, 1940); Makedonia (Fage, 1921). Thraki (Drensky, 1928); Sporades (Werner, 1934); Crete: Chania, Omalos (Roewer, 1928).

Scotophaeus peninsularis Roewer, 1928

Figs 48-49, 73

Scotophaeus subcorticis Levy, 1999b (p. 440, Figs 24-25), Ben Zakkay, Israel (type locality).

Syn. n.

Identification: Roewer (1928, p. 108, Fig. 14).

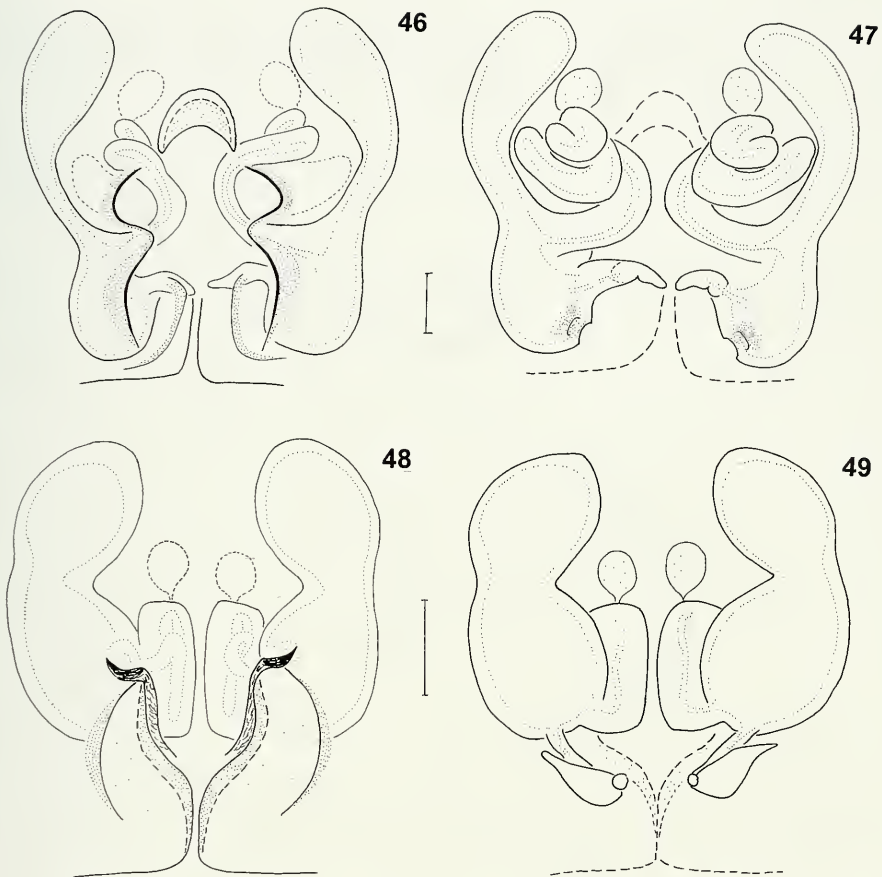
Material. CRETE: CHANIA: Site 3 (a 1 ♀) (leg. Lymberakis).

Comparative material examined: *S. peninsularis*: PELOPONNISOS: Vityna, under a stone in a woodland, 1600m (1 ♀ holotype, SMF: CR 584/34).

Taxonomy. Levy (1999b) described *S. subcorticis* from one female collected in Israel. The characters of our specimen (Figs 48-49) fit very well with his excellent description. Having examined the type of *S. peninsularis*, however, we have no doubt that these two species are identical. This cannot be recognised from Roewer's (1928) drawing.

Ecology. This species is known to occur under the bark of *Eucalyptus* and pine trees (Levy, 1999b).

Distribution. Israel, Greece.



FIGS 46-49

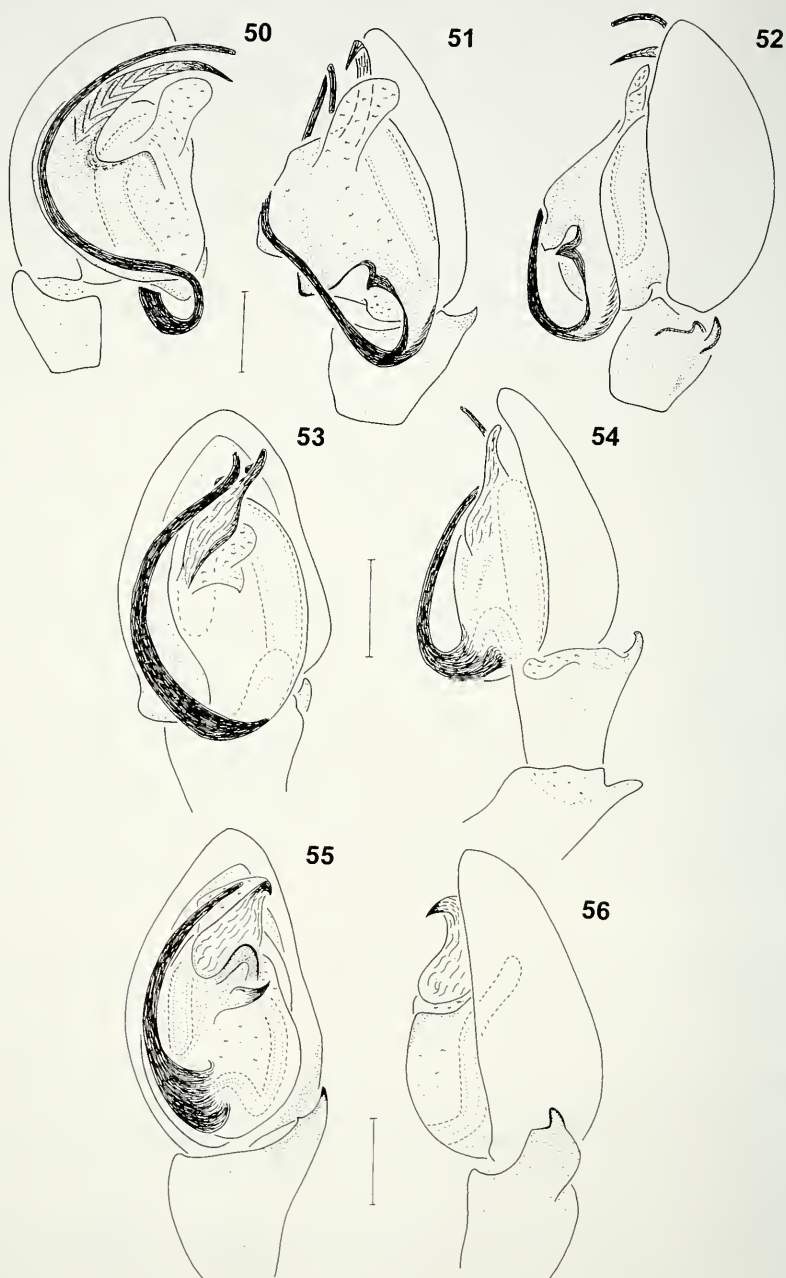
Scotophaeus scutulatus: 46, epigyne; 47, vulva. *S. peninsularis*: 48, epigyne; 49, vulva. Scale lines 0.1mm.

Synphosus palearcticus Ovtsharenko, Levy & Platnick, 1994 Figs 50-52, 57-58, 73

Identification: Ovtsharenko *et al.* (1994, p. 6, Figs 21-25).

Material. CRETE: RETHYMNO: Site 32 (a 1 ♀) (leg. Nikolakakis). ANTIKYTHIRA: Potamos, 700m W: sparse phrygana on sandy soil close to the village, (3 ♂ 3 ♀ ♀, pitfall traps 27/3/2001 – 5/8/2001, leg. Chatzaki).

Taxonomy. Taxonomic characters fit the description of Ovtsharenko *et al.* (1994). The main characters of this species are: retrolateral tibial apophysis hooked, embolus long, filiform, with a pointed process at its retrolateral base (Figs 50-52), epigyne with anterior pouches (Fig. 57), receptacles strongly coiled (Fig. 58). In our specimens (Figs 50-51), the shape of the median, translucent flange differs from those illustrated by Ovtsharenko *et al.* (1994, Fig. 22).



FIGS 50-56

Synaphosus palearcticus: 50-52. *S. trichopus*: 53, 54. *Cryptodrassus creticus* sp. n.: 55, 56. Palp of ♂ prolateral view (50), ventral view (51, 53, 55), retrolateral view (52, 54, 56). Scale lines 0.1mm.

Ecology. This species has been found in degraded phrygana on Crete and Antikythira. On Crete it was collected at 1200m.

Distribution. Central Palaearctic (new record for Europe).

***Synaphosus trichopus* (Roewer, 1928) comb. n.**

Figs 53-54, 59-60, 73

Zelotes trichopus Roewer, 1928 (p. 110, Fig. 15): Crete, Chania, Governeto Monastery in Akrotiri (type locality).

Material. CRETE: RETHYMNO: Site 40 (b 7 ♂♂ 6 ♀♀; c 1 ♀) (all leg. Nikolakakis); IRAKLEIO: Site 44 (a 4 ♂♂; b 5 ♀♀); Site 45 (a 1 ♂ 1 ♀); Site 47 (a 13 ♂♂ 2 ♀♀; b 6 ♂♂ 15 ♀♀; c 2 ♂♂ 3 ♀♀ [MHNG]) (all leg. Nikolakakis); Site 46 (a 1 ♀) (leg. Papadimitrakis). PELOPONNISOS: Mainalo Mt., alpine phrygana, (2 ♂♂, 22 ♀♀, pitfall traps 9/7/1997 – 12/10/1997, leg. Anastasiou). KARPATOS: Pyles – Volada, 1km E, phrygana on a field, which had been burnt earlier (3 ♂♂ 1 ♀, pitfall traps 12/5/2001 – 23/8/2001, leg. Chatzaki).

Comparative material examined: *Zelotes trichopus*: 1 ♀ holotype, SMF: CR 597/47.

Taxonomy. Roewer described this species on the basis of one female and placed it into the genus *Zelotes*, owing to the presence of a preening brush on Me III, as it is the case in many species of the genus *Synaphosus*. However, all the distinctive characters of *Synaphosus* are present in the type material here examined: small size, preening brush on Me III, elongated superior claws on Ta IV, anterior pouches on the epigyne, and highly coiled receptacles. The male of this species is presented here for the first time.

Measurements ♂ (♀), n = 4 (1): TL: 2.8-3.5 (3), PL: 1.3-1.8 (1.4), PW: 0.9-1.3 (1), PL/PW: 1.3-1.4 (1.4), OL: 1.4-1.8 (1.5).

♂ ♀: Yellow spiders of small size. Habitus same as in *Zelotes*. Abdomen with grey marks dorsally.

Legs: Ta I-II with scopula hairs. Ta III-IV with dense stripe of small spines. The claw of Ta IV elongated. Spination: Fe: I d 1-2; II d 2-3; III d 7; IV d 3-4. Pa: I-II, IV -; III r 1. Ti: I v 0-2; II v 1-3; III-IV spinose. Me: I v 0-3; II v 3-4; III-IV spinose.

♂ Pedipalp (Figs 53-54): Fe with 2 dorsal spines. Pa with retrolateral apophysis (Fig. 54), as in the *gracillimus* - group (see Ovtsharenko *et al.*, 1994). Tibial apophysis small, with hooked tip. Cymbium oval, with a projecting angle on its prolateral base. Embolus long, filiform, starting from the retrolateral base of the tegulum, its end freely pointed, guided by a conductor-like process, which starts from the centre of the tegulum. Almost half of the tegular wall ventrally membranous, without free projection.

Epigyne (Fig. 59): Median anterior margin as in *Zelotes*. Introductory orifices formed by the sclerotized posterior rims of the two large anterior pouches that lead to the introductory ducts.

Vulva (Fig. 60): Receptacles asymmetrical and less coiled than in *S. palearcticus*. A glandular head present on the lateral sides of the introductory ducts.

Ecology. *S. trichopus* occurs at phryganic sites of the islands Crete and Karpathos, but it has also been found on alpine phrygana in Peloponnisos.

Distribution. Greece: Peloponnisos, Isls.: Crete, Karpathos. (Greek endemic?).

In Crete, this species is not very common, occurring only at sites in the southern parts of the districts of Rethymno and Irakleio (Fig. 72). Considering the wide distributions of other species in this genus, we presume that this species will turn out not to be endemic to our region.

***Cryptodrassus creticus* Chatzaki sp. n.**

Figs 55-56, 61-62, 73

Material. Type material: Site 64d (Bramiana lake, leg. Papadimitrakis) (1 ♂ holotype [NHMC]); Site 64e (1 ♀ paratype [NHMC]).

CRETE: RETHYMNO: Site 39 (b 1 ♀) (leg. Nikolakakis); LASITHI: Site 55 (a 1 ♀ [MHNG]) (leg. Chatzaki).

Taxonomy. The general appearance of these spiders is very close to that of *Synaphosus*. However the characters of the genital organs correspond with those of its related genus *Cryptodrassus*, namely: the absence of a translucent flange on the tegulum, smaller embolus and less coiled epigyne (see Ovtsharenko *et al.*, 1994, Figs 7-11 and Weiss *et al.*, 1998, Figs 1-4). Until now, this genus was represented only by a single species, *C. pulchellus* Miller, 1943, which was later synonymised with *C. hungaricus* (Balogh, 1935) by Weiss *et al.* (1998). Here, the male and female of a new *Cryptodrassus* species are presented.

Measurements ♂ (♀), n = 1 (3): TL: 3.1 (4.2-4.8), PL: 1.5 (1.9-2), PW: 1.1 (1.4), PL/PW: 1.36 (1.3-1.4), OL: 1.5 (2-2.4).

♂ ♀: Small-sized, yellow spiders. Habitus like in *Zelotes*. Eyes round, PME oval.

Legs: Ta I-II with scopula hairs. Ta III-IV with dense stripe of small spines. Claws of Ta IV elongated. Spination: Fe: I-II d 1-2 p1; III-IV d 6-7. Pa: I-II, IV - ; III p 1 r 1. Ti: ♂ I v 4, II v 4 p 1, ♀ I-II v 1; III-IV spinose. Me: ♂ I v 4, ♀ I v 2; II v 3; III-IV spinose.

♂ Pedipalp (Figs 55-56): Fe with 3 dorsal spines. Tibial apophysis with wide base and bifid end. Embolus filiform and long, though relatively smaller than in *Synaphosus* (see also Figs 50-54). Conductor strong, with sclerotized claw at base.

Epigyne (Fig. 61): Anterior median hood small, bell-shaped. Margin of atrium U-shaped.

Vulva (Fig. 62): Lateral glandular heads attached to dorsal pouches of atrium. Spermathecae with two chambers: a ventral oval one (1) and a dorsal globular one (2).

Ecology. This species has been found in degraded phrygana up to 750m (Fig. 73).

Distribution. Crete.

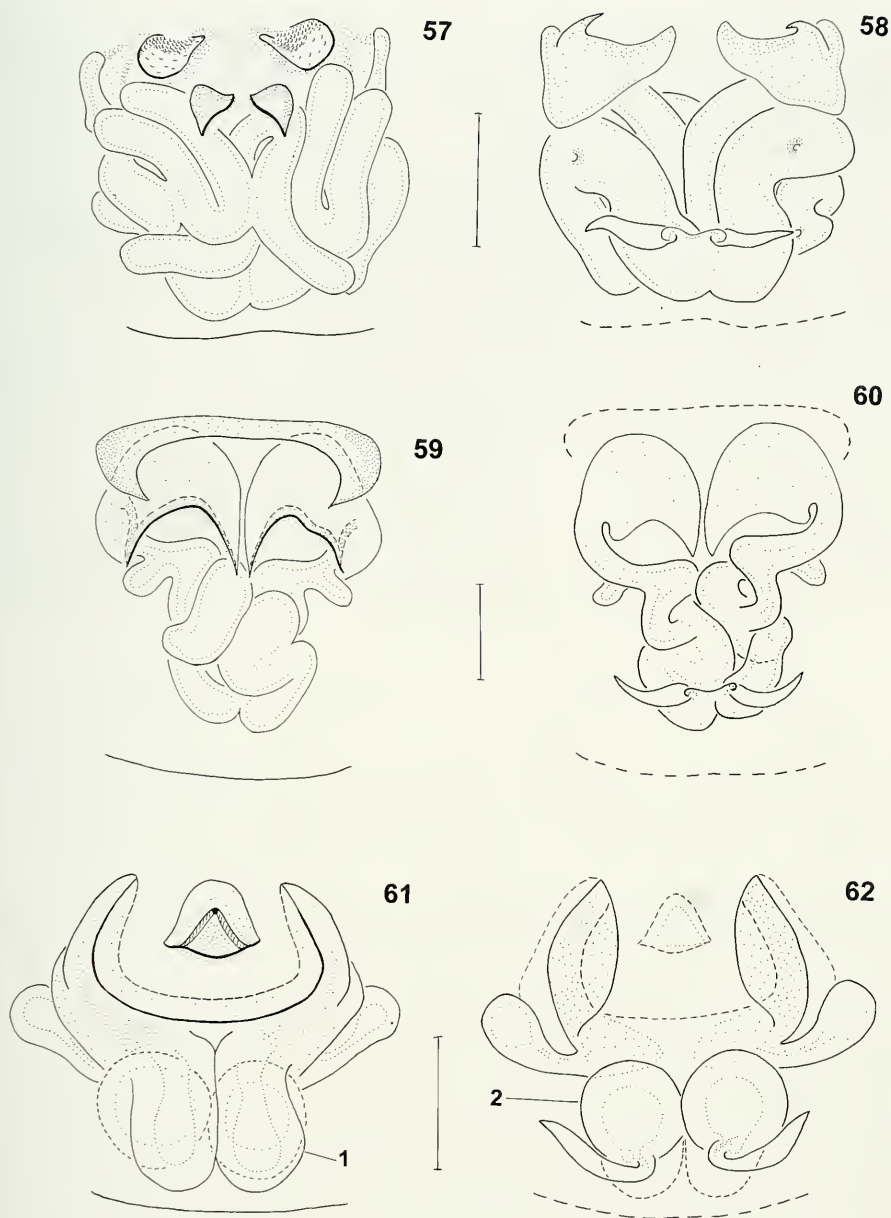
***Cesonia aspida* Chatzaki sp. n.**

Figs 63-68, 74

Etymology. The species name refers to the characteristic pattern of the opisthosoma (Fig. 68), *aspida* meaning shield in Greek; noun in apposition, hence invariable.

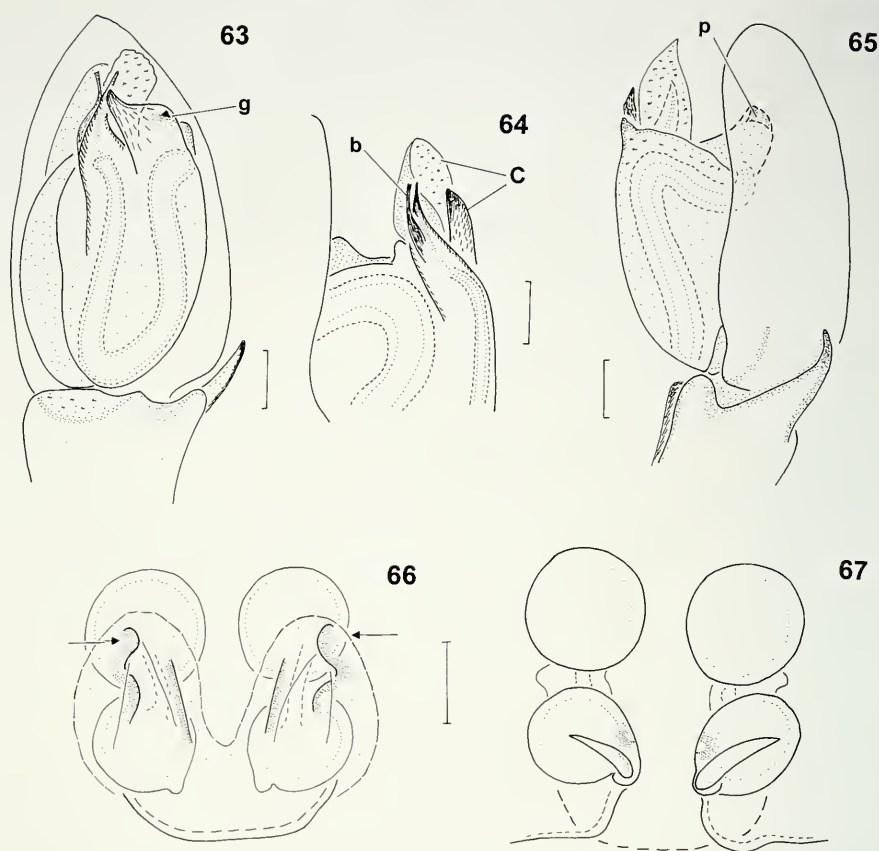
Material. Type material: Site 3a (Chania. Elafonisi) (1 ♂ holotype, 1 ♀ paratype [NHMC]; 1 ♂ 1 ♀ paratypes [MHNG]).

CRETE: CHANIA: Site 1 (a 6 ♂ ♂); Site 2 (a 4 ♂ ♂); Site 3 (b 1 ♀); Site 6 (e 2 ♂ ♂ 1 ♀; f 1 ♂; g 1 ♂); Site 7 (g 2 ♀ ♀) (all leg. Lymberakis); Site 14 (c 1 ♂); Site 21 (a 1 ♂) (all leg. Paragamian); RETHYMNO: Site 26 (a 1 ♂; b 10 ♀ ♀; c 5 ♀ ♀) (all leg. Lymberakis); Site 33 (a 1 ♀) (leg. Trichas); IRAKLEIO: Site 52 (b 1 ♂) (leg. Nikolakakis); LASITHI: Site 55 (a



FIGS 57-62

Synaphosus palearcticus: 57-58. *S. trichopus*: 59-60. *Cryptodrassus creticus* sp. n.: 61-62.
Epigyne (57, 59, 61), vulva (58, 60, 62). Scale lines 0.1mm.



FIGS 63-67

Cesonia aspida sp. n.: 63, palp of ♂, ventral view; 64, palp of ♂, prolateral view; 65, palp of ♂, retrolateral view; 66, epigyne; 67, vulva. Scale lines 0.1mm.

1 ♂); Site 73 (a 1 ♂ 1 ♀) (all leg. Chatzaki); Site 63 (a 1 ♂ 1 ♀; b 1 ♂) (all leg. Stathi); Site 65 (a 1 ♀; b 1 ♀); Site 68 (a 1 ♀) (all leg. Papadimitrakis); Site 59 (c 1 ♂); Site 70 (a 2 ♂ ♂) (all leg. Trichas).

Taxonomy. The genus *Cesonia* Simon has been revised by Platnick & Shadab (1980). Its status and its monophyly are not yet fully clarified, because of its close relationship with the genera *Herpyllus* and *Eilicina* (the latter presently considered as a synonym of *Cesonia*). The diagnostic characters of *Cesonia* are: pattern with two to four dark longitudinal bands, either covering the entire length, or part of the body dorsally and part of the length of the abdomen laterally, and being separated by intervening light bands; PME closer to PLE than to each other; embolus close to median apophysis (which may be fused to the conductor), protruding beyond the tegulum and frequently with a membranous conductor. There are 30 *Cesonia* species diagnosed and described from the American continent, which belong to four species groups.



FIG. 68

Cesonia aspida sp. n. Habitus of ♂, dorsal view. Photo: B. Knoflach.

Until now, none has yet been recorded from Europe. Here we present the male and female of a new species from Crete, which we tentatively place in this genus.

Measurements ♂ (♀) $n = 7$ (1): TL: 4.3-5.6 (7.8), PL: 2.1-2.7 (3), PW: 1.8-2.1 (2.4), PL/PW: 0.95-1.23 (1.25), OL: 2.1-2.8 (4.5).

♂ ♀: Medium-sized spiders. Colour variable, from dark brown to greyish black. Prosoma dorsally with three light and two dark, longitudinal bands. No scales present, neither on the dark nor on the light bands. Labium longer than wide, maxillae almost parallel to each other. Chelicerae with small fangs and three denticles on posterior rim of cheliceral furrow. PME closer to PLE than to each other. Opisthosoma with two light dorsal bands connected at the posterior end, leaving a characteristic dark mark in the middle, forming a pattern resembling a Minoan shield (Fig. 68). Longitudinal lateral dark bands also present, one at each side. Males with anterior scutum. Because of the abdominal pattern of this species („...pair of paramedian light stripes, reaching beyond the middle of the abdomen“) and the structure of the epigyne („...with lateral guides“), we are inclined to place it in the *lugubris* group (see Platnick & Shadab, 1980).

Legs: Ta I-IV and Me I-II, scopulated. Spination: Fe: I-II d 3 p 1; III d 7; IV d 5-6. Pa: I-II - ; III-IV r 1. Ti: I - ; II v 2; III-IV spinose. Me: I - ; II v 1; III-IV spinose.

♂ Pedipalp (Figs 63-65): Fe and Pa spinose. Tibial apophysis slender, claw-like. Tegulum robust, with strong process on its dorsal side (p). Sperm duct bulging, covering almost the whole surface of the tegulum. Embolus small, tapering, starting at

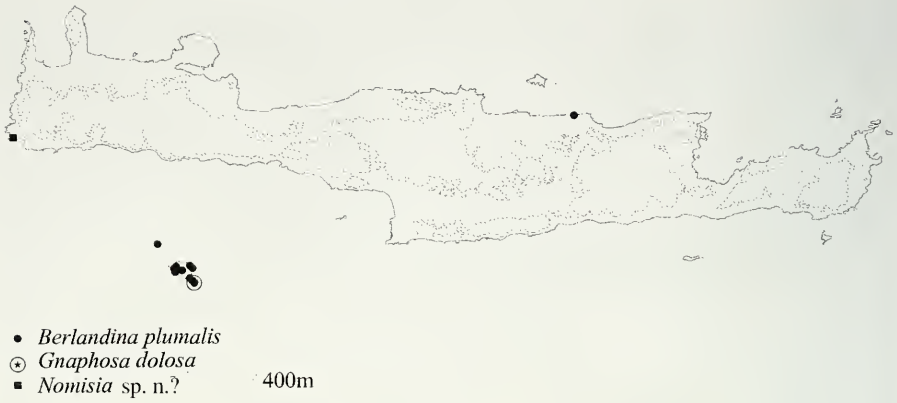


FIG. 69

Berlandina plumalis, *Gnaphosa dolosa*, *Nomisia* sp.n.?, distribution on Crete.



FIG. 70

Drassodes lutescens, *Drassodes lapidosus*, distribution on Crete.



FIG. 71

Drassodes oreinos sp. n., distribution on Crete.



FIG. 72

Drassodes serratichelis, *Leptodrassus pupa*, distribution on Crete.

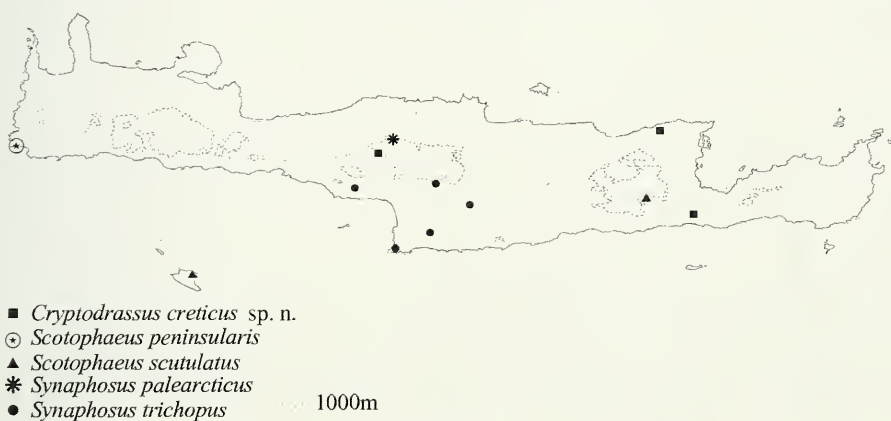


FIG. 73

Scotophaeus scutulatus, *S. peninsularis*, *Synaphosus palearcticus*, *S. trichopus*, *Cryptodrassus creticus* sp. n., distribution on Crete.



FIG. 74

Cesonia aspida sp. n., distribution on Crete.

the prolateral side of the anterior part of the tegulum. Slender side branch of embolus with a bifid tip (b). Conductor (C) with a membranous lobe and a sclerotized ventral tip; a large glandular pore opening at its retrolateral edge (g).

Epigyne (Fig. 66): Lateral margins faintly sclerotized, leading to the epigastric furrow. Introductory orifices situated laterally.

Vulva (Fig. 67): Spermathecae with two globular lobes, connected with a wide ventral zone with lateral heads. Fertilisation ducts originating from posterior lobes, close to a large glandular pore.

Ecology. *Cesonia aspidia* sp. n. is widespread on Crete (Fig. 74). It occurs in sandy habitats and in phryganic sites close to the sea. This new species was collected up to 1400m on Mt. Psiloreitis and up to 1200m on the Lefka Ori Mts. It has also been found on the two islands close to Crete, i.e. Gavdos and Dia. Adults are present from late spring to autumn.

Distribution. Crete (endemic?). First European representative of this "American" genus.

CONCLUDING REMARKS

In this paper we present the taxonomy and distribution of 17 species belonging to eleven genera. *Berinda aegilia*, *Drassodes oreinos*, recorded only from the high elevations of the Cretan mountains, *Cryptodrassus creticus* and *Cesonia aspidia* are species new to science. *Anagraphis pallida*, recorded from Attiki, *Drassodes serraticheles* and *Synaphosus trichopus* are new combinations of the earlier described species *Talanites pallidus* Hadjissarantos, 1940, *Mesklia serraticheles* Roewer, 1928 and *Zelotes trichopus* Roewer, 1928. The new combination of *D. serraticheles* brings the genus *Mesklia* into the synonymy of *Drassodes*. Based on the comparison of type specimens examined, *Drassodes volidis* and *Scotophaeus subcorticis* are synonymised with *D. lutescens* and *S. peninsularis*, respectively. *Nomisio palaestina* and *Synaphosus palearcticus* are recorded for the first time in Europe and the genus *Cesonia* is for the first time reported from Europe with a new species. Also, an enigmatic species belonging to the genus *Nomisio*, is presented.

The geographical distributions of these species are not always clear. Six of them are widespread; namely, either Palaearctic with a Mediterranean centre of distribution (*Berlandina plumalis*, *Gnaphosa dolosa*, *Drassodes lapidosus*), or synanthropic, which has lead to a wide distribution (*Drassodes lutescens*, *Scotophaeus scutulatus*, *Synaphosus palearcticus*). Three species have an eastern Mediterranean distribution (*Nomisio palaestina*, *Leptodrassus pupa*, *Scotophaeus peninsularis*), and three are Greek endemics (*Anagraphis pallida*, *Berinda aegilia* sp. n., *Drassodes serraticheles*). Another five species are recorded only from Crete (*Drassodes oreinos* sp. n., *Nomisio* sp.n.?, *Synaphosus trichopus*, *Cryptodrassus creticus* sp. n. and *Cesonia aspidia* sp. n.). *Gnaphosa dolosa* is recorded only from Gavdos, *Nomisio palaestina* only from Kos and *Anagraphis pallida* only from Attiki. Our lack of knowledge of the Gnaphosidae of our area does not allow to be sure about the endemisms indicated here, until a more detailed study of the surrounding areas has been carried out.

TABLE 1. Variation of ♂ *Drassodes lapidosus* on Crete. For each site, the number of males corresponding to the *lapidosus* and *cupreus* types of dentition (see Grimm, 1985, p. 120) and of intermediates are given, and also numbers of large L (total length ≥ 10 mm) and small specimens s (total length < 10 mm). L/s indicate the number of large versus small individuals belonging to each of the above types.

	" <i>lapidosus</i> "	" <i>cupreus</i> "	intermediate	small size	large size
	L / s	L / s	L / s	< 10 mm	< 10 mm
Site 4	1 /				1
Site 5	1 /		/ 1	1	1
Site 6		/ 1		1	
Site 32	1 /				1
Site 39	/ 1			1	
Site 42	2 /	1 /			3
Site 43	9 / 2	4 / 7	24 / 3	12	37
Site 49	1 / 4		1 /	5	1
Site 51	6 /	8 / 1	13 / 3	4	27
Site 56	1 / 2			2	1
Site 58	/ 1			1	
Site 59			1 /		1
Site 61		1 /			1
Site 67		/ 2		2	
Total	22 / 10	14 / 11	39 / 7	29	74

Many of the records reported here are based on a single or on a few individuals. *Drassodes lutescens*, and to a lesser extent *D. lapidosus*, *D. oreinos* sp. n. and *Cesonia aspida* sp. n., are the only widespread species on Crete. The first three show a clear zonation in their distribution along the altitudinal gradient of Cretan mountains, with little overlap (*D. lutescens* is distributed in the lowlands, *D. lapidosus* in the zone 800-1500m and *D. oreinos* sp. n. from 1600m upwards). *Berlandina plumalis* is the dominant spider species on the island of Gavdos but not on Crete, which is probably due to the dominance of *Pterotricha lentiginosa* (C.L. Koch, 1837) on Crete.

ACKNOWLEDGEMENTS

We are very grateful to M. Nikolakakis, M. Papadimitrakakis and S. Roberts, who collected and sorted most of the material presented in this paper, and to Dr J. Murphy for linguistic revision of the text. We also thank Dr G. Anastasiou for loan of important comparative material from Peloponnisos, Prof. A. Legakis of the University of Athens, for loan of the material of Hadjissarantos' collection and Dr M. Grasshoff for loan of specimens of Roewer's collection, Dr N.I. Platnick for taxonomical advice, Dr J. Gruber for providing important literature and Dr B. Knoflach for advice on the drawings. Financial support has been given by the Biology Department of the University of Crete, the Natural History Museum of Crete, the University of Innsbruck and the Onassis Foundation.

REFERENCES

- BRIGNOLI, P. M. 1986. Rapports biogéographiques entre les Araignées des Balkans et du Moyen Orient (Araneae). *Biologia Gallo-hellenica* 12: 93-101.
- BRISTOWE, W. S. 1935. The Spiders of Greece and the adjacent islands. *Proceedings of the Zoological Society of London* 1934: 733-788.
- CHATZAKI, M. 1998. Systematics and phenology of ground living spiders of the island group Gavdos - Gavdopoula. *Master Thesis, University of Crete, Irakleio*, 150 pp.
- CHATZAKI, M., TRICHAS, A., MARKAKIS, G. & MYLONAS, M. 1998. Seasonal activity of the ground spider fauna in a Mediterranean ecosystem (Mt. Youchtas, Crete, Greece). *Proceedings of the 17th European Colloquium of Arachnology, Edinburgh 1997*: 235-243.
- CHATZAKI, M., THALER, K. & MYLONAS, M. 2002. Ground spiders (Gnaphosidae; Araneae) of Crete (Greece). Taxonomy and distribution. I. *Revue suisse de Zoologie* 109(3): 559-601.
- DALMAS, R. DE 1921. Monographie des araignées de la section des *Pterotricha*. *Annales de la Société entomologique de France* 89: 233-328.
- DELTSHEV, C. 1999. A faunistic and zoogeographical review of the spiders (Araneae) of the Balkan Peninsula. *Journal of Arachnology* 27(1): 255-261.
- DENIS, J. 1937. On a collection of spiders from Algeria. *Proceedings of the Zoological Society of London* 1936: 1027-1060.
- DRENSKY, P. 1928. Contribution a l'étude des Arachnides de la Thrace du sud et côtes de la Mer Egée. *Travaux de la Société bulgare des sciences naturelles, Sofia* 13: 183-192.
- FAGE, L. 1921. Travaux scientifiques de l'armée d'Orient (1916-1918): Arachnides. *Bulletin du Muséum d'Histoire Naturelle de Paris* 1921: 96-102, 173-177, 227-232.
- GRIMM, U. 1985. Die Gnaphosidae Mitteleuropas (Arachnida, Araneae). *Abhandlungen des Naturwissenschaftlichen Vereins in Hamburg (NF)* 26: 1-317.
- HADJISSARANTOS, H. 1940. The spiders of Attiki. *Thesis, University of Athens, Athens*, 132 pp. (in Greek).
- KULCZYNSKI, W. 1911. Fragmenta arachnologica, IX. XVI. Araneorum species nonnullae in Syria a rev. P. Bovier-Lapierre et in Palaestina a rev. E. Schmitz collectae. XVII. Araneae nonnullae Europeae. *Bulletin de l'Académie des Sciences de Cracovie (Classe des sciences mathématiques et naturelles)* B 1911: 12-75, pl. 1-2.
- LEVY, G. 1995. Revision of the spider subfamily Gnaphosinae in Israel (Araneae: Gnaphosidae). *Journal of Natural History* 29: 919-981.
- LEVY, G. 1999 a. Spiders of the genera *Anagralus* and *Talanites* (Araneae, Gnaphosidae) from Israel. *Israel Journal of Zoology* 45: 215-225.
- LEVY, G. 1999 b. Spiders of six unknown Drassodine genera (Araneae: Gnaphosidae) from Israel. *Israel Journal of Zoology* 45: 427-452.
- OVTSHARENKO, V. I., PLATNICK, N. I. & SONG, D. X. 1992. A review of the North Asian ground spiders of the genus *Gnaphosa* (Araneae, Gnaphosidae). *Bulletin of the American Museum of Natural History* 212: 1-88.
- OVTSHARENKO, V. I., LEVY, G. & PLATNICK, N. I. 1994. A review of the ground spider genus *Synphosus* (Araneae, Gnaphosidae). *American Museum Novitates* 3095: 1-27.
- PLATNICK, N. I. 2001. The World Spider Catalog, Version 2.0: <http://research.amnh.org/entomology>.
- PLATNICK, N. I. & OVTSHARENKO, V. I. 1991. On Eurasian and American *Talanites* (Araneae, Gnaphosidae). *Journal of Arachnology* 19: 115-121.
- PLATNICK, N. I. & SHADAB, M. U. 1980. A revision of the spider genus *Cesonia* (Araneae, Gnaphosidae). *Bulletin of the American Museum of Natural History* 165: 337-385.
- ROBERTS, M. J. 1985. The spiders of Great Britain and Ireland. I. *Harley Books*, 229 pp.

- ROEWER, C. F. 1928. XI. Araneae. In: Zoologische Streifzüge in Attika, Morea und besonders auf der Insel Kreta. *Abhandlungen des naturwissenschaftlichen Vereins Bremen* 27: 92-123.
- ROEWER, C. F. 1961. Araneae Dionycha aus Afghanistan. I. *Lunds Universitets Arsskrift*. (N. F.) 58: 3-33.
- SIMON, E. 1914. Les Arachnides de France. *Roret, Paris*, 6/1, 308pp.
- THALER, K. 1981. Bemerkenswerte Spinnenfunde in Nordtirol (Österreich) (Arachnida: Aranei). *Veröffentlichungen des Tiroler Landesmuseum Ferdinandeum (Innsbruck)* 61: 105-150.
- WERNER, F. 1934. Ergebnisse einer zoologischen Studien- und Sammelreise nach den Inseln des Aegaeischen Meeres. V. Arthropoden. *Sitzungsberichte der Akademie der Wissenschaften in Wien. Abt. I* 143 (5-7): 159-168.
- WEISS, I., SZINETAR, C. & SAMU, F. 1998. Zur Taxonomie von *Cryptodrassus hungaricus* (Balogh, 1935) (Araneae: Gnaphosidae). *Arachnologische Mitteilungen* 16:56-59.

Description of a new species of *Leiurus* Ehrenberg, 1828 (Scorpiones, Buthidae) from the South of Jordan

Wilson R. LOURENÇO¹, David MODRY² & Zuhair AMR³

¹ Laboratoire de Zoologie (Arthropodes), Muséum National d'Histoire Naturelle, 61 rue de Buffon, F-75005 Paris, France. E-mail: arachne@mnhn.fr

² Department of Parasitology, University of Veterinary and Pharmaceutical Sciences, Palackého 1-3, CZ-61242, Brno, Czech Republic. E-mail: modryd@vfu.cz

³ Department of Biology, Jordan University of Science and Technology, P.O. Box 3030, Irbid, Jordan.

Description of a new species of *Leiurus* Ehrenberg, 1828 (Scorpiones, Buthidae) from the South of Jordan. - A new species of buthid scorpion from the south of Jordan, belonging to the genus *Leiurus* Ehrenberg, is described on the basis of a female collected NW of Al-Mudawwarah. The new species, *Leiurus jordanensis* sp. n., can be readily distinguished from the only other known species in the genus, *Leiurus quinquestriatus* (Ehrenberg, 1828), which is yellowish, by its generally blackish brown coloration.

Key-words: Scorpion - new species - *Leiurus jordanensis* sp. n. - Buthidae - Al-Mudawwarah - Jordan.

INTRODUCTION

The genus *Leiurus* was established by Ehrenberg 1828 (in Hemprich & Ehrenberg, 1828) as a subgenus of *Androctonus* for *Androctonus (Leiurus) quinquestriatus* Ehrenberg. For many years, most taxonomists have attributed the authorship of both genus and species to Hemprich & Ehrenberg (1829) (e.g., Kraepelin, 1891; Vachon, 1949, 1952; Levy & Amitai, 1980; Francke, 1985; Sissom, 1990). This error was finally clarified by Braunwalder & Fet (1998) (see also Fet, 1997 and Fet & Lowe, 2000 for details).

At the time of its description, *Leiurus* was considered to be a subgenus of *Androctonus* (Ehrenberg, 1828). Several authors (e.g., Kraepelin, 1891) regarded *Leiurus* as a synonym of the genus *Buthus* Leach. Finally Vachon (1949) raised *Leiurus* to generic rank, containing, at that time, only one species, *Leiurus quinquestriatus* Ehrenberg.

Vachon (1949) was confident that the genus *Leiurus* was monotypic and he restrained himself from revising its intraspecific structure. Two subspecies were, however, considered by Vachon (1949) to be valid: *Leiurus quinquestriatus quinquestria-*



FIGS 1-2

1. The natural habitat of *Leiurus jordanensis* sp. n. 2. *Leiurus jordanensis* sp. n., female holotype in the natural habitat.

tus (Ehrenberg, 1828) and *Leiurus quinquestriatus hebraeus* (Birula, 1908). The systematic position of *Leiurus quinquestriatus hebraeus* was discussed by Levy *et al.* (1970), who presented tables which differentiate this subspecies from *L. q. quinquestriatus*. The position of the two subspecies was again discussed by Levy and Amitai (1980) in their monographic work *Fauna Palaestina (Scorpiones)*. The genus and species *Leiurus quinquestriatus* has also been the subject of more regional studies. In his treatment of the scorpions of Saudi Arabia, Vachon (1979) made reference to *Leiurus quinquestriatus*, without, however, commenting on its rank as a subspecies. He made a few remarks concerning the 'variety' *Androctonus quinquestriatus brachycentrus* (Ehrenberg, 1828) and suggested that more material would be necessary to precisely define the variability of the coloration of metasomal segment five. More recently, in a study on the scorpions of Yemen, Sissom (1994) also made reference to *Leiurus quinquestriatus*, but he decided to not assign the Yemen population to any particular subspecies.

Very few records are available regarding the presence of *Leiurus quinquestriatus quinquestriatus* or *Leiurus quinquestriatus hebraeus* in Jordan (Vachon, 1966; Levy & Amitai, 1980; Fet & Lowe, 2000), and the species *L. quinquestriatus* apparently is not present in the south of that country.

During recent field work in the south of Jordan, one of us (DM), collected an unusual specimen of scorpion. The study of this specimen, revealed that it is a new species of *Leiurus*, which is described below.

TAXONOMY

Leiurus jordanensis sp. n.

Figs 2-8

Type material: 1 female holotype, Jordan, NW of Al-Mudawwarah, alt. ca. 700 m (29° 19' 22.3" N, 35° 59' 24.3" E), VII-2000 (D. Modry coll.). Deposited in the Muséum d'histoire naturelle, Genève.

Etymology: The specific name refers to the country in which the new species was found.

DIAGNOSIS

The new species can clearly be placed in the genus *Leiurus* Ehrenberg on account of the presence of 5 carinae on tergites I and II. It is distinguished from *Leiurus quinquestriatus* (Ehrenberg, 1828), the only previously known species of the genus, by the following characters: The new species is generally blackish brown, whereas *L. quinquestriatus* is yellowish, in some cases with brown spots on the carapace, tergites and, in particular, on metasomal segments V. The ventrolateral carinae of metasomal segment V are armed with spinoid granules, and the anal arch is composed of 3 spinoid lobes, whereas in *L. quinquestriatus* the ventrolateral carinae are armed with 3-4 rounded lobes and the anal arch is composed of 3 rounded lobes. The metasomal carinae are strongly marked and intercarinal spaces are smooth to shagreened, whereas in *L. quinquestriatus* the carinae are moderately marked and less regular, and the intercarinal spaces show a moderate to weak granulation. Morphometrical values of the female holotype of *L. jordanensis* sp. n. are different from those of a female of *L. quinquestriatus* with the same total length (see Table I).

TABLE I. Comparative morphometric values (in mm) of the female holotype of *Leiurus jordanensis* sp. n. and of a female of *L. quinquestriatus* from Saudi Arabia.

	<i>L. jordanensis</i> sp. n.	<i>L. quinquestriatus</i>
Total length	74.0	74.0
Carapace:		
- length	8.5	8.3
- anterior width	6.4	6.0
- posterior width	10.5	10.4
Metasomal segment I:		
- length	6.0	5.2
- width	4.6	5.6
Metasomal segment V:		
- length	10.6	9.8
- width	3.0	3.8
- depth	2.8	3.7
Vesicle:		
- width	3.4	3.6
- depth	3.2	3.4
Pedipalp:		
- Femur length	10.1	8.1
- Femur width	2.3	2.4
- Patella length	11.2	9.4
- Patella width	2.8	3.3
- Tibia length	19.5	16.5
- Tibia width	2.3	2.7
- Tibia depth	2.6	3.0
Movable finger:		
- length	13.6	11.2

DESCRIPTION (based on female holotype)

Coloration. Generally blackish brown with some diffuse pale spots on prosoma and mesosoma. Prosoma: carapace mostly blackish brown, darker anteriorly; lateral margins with some narrow lighter zones. Mesosoma: blackish brown, with some lighter zones on each side of the median carinae on segments I and II. Metasoma: all segments blackish brown. Vesicle pale yellow; aculeus yellowish at the base and reddish at its extremity. Venter reddish yellow; sternite VII with brown spots. Chelicerae yellowish with dense reticulated dark spots; teeth blackish. Pedipalps: blackish brown overall except for yellowish fingers of tibia; rows of granules on dentate margins of fingers dark reddish. Legs with the four proximal segments brownish and the three distal ones yellowish.

Morphology. Prosoma: Anterior margin of carapace weakly emarginate. Carapace carinae strongly developed; central median, posterior median, anterior median, central lateral and central median carinae strong; posterior median carinae terminating distally in a small spinoid process extending very slightly beyond the posterior margin of the carapace. Intercarinal spaces with some irregular granules, the rest of the surface rather smooth, especially laterally and distally. Median ocular tubercle only slightly anterior to the center of the carapace, almost central in position; median eyes separated



FIGS 3-8

3-7. *Leirus jordanensis* sp. n., female holotype. 3. Carapace and mesosomal tergite I, dorsal aspect. 4. Chelicera, dorsal aspect. 5. Right pedipalp, dorsal aspect showing arrangement of trichobothria. 6. Granulations on the dentate margin of the movable finger of the pedipalp-tibia. 7. Metasomal segment V and telson, lateral aspect. 8. *Leirus quinquestriatus* female. Metasomal segment V and telson, lateral aspect. Scales: figures 3-6 = 3 mm; figures 7-8 = 5 mm.

by more than two times their diameter. Four pairs of lateral eyes; the fourth eye only half the size of the others three. Mesosoma: Tergites I-II pentacarinat; III-IV tricarinat. All carinae strong, granular; each carina terminating distally in a spinoid process extending slightly beyond the posterior margin of the tergite. Median carinae on tergite I moderate to strong; on II-VI strong, crenulate and terminating distally in a spinoid process extending very slightly beyond the posterior margin of the tergite. Tergite VII pentacarinat, with lateral pairs of carinae strong and fused; median carinae present in the proximal half, moderate to strong. Intercarinal spaces weakly granular, almost smooth, except for the strongly granulated lateral margins of tergites III-VI. Sternites: Lateral carinae absent from sternite III, moderate to weak on sternites IV-VI, strong, crenulate on VII. Submedian carinae absent on sternites III-V, moderate to weak on VI, strong and crenulate on VII. Pectines moderately long; pectinal teeth count 30-30. Metasoma: Segments I-III with 10 carinae, crenulate; lateral inframedian carinae on I moderate to strong, crenulate; on II present only in posterior half, crenulate; on III limited to posterior third; segment IV with 8 keels. Dorsolateral carinae on all metasomal segments moderate to strong, without any enlarged denticles distally. All the other carinae on segments I-IV moderate to strong. Segment V with 5 keels; ventro-median carinae strong, with several strongly spinoid granules distally; anal arch with 3 spinoid lobes. Dorsal furrows of all metasomal segments moderately to weakly developed, smooth; intercarinal spaces practically smooth, with only a few strong granules on the ventral surface of segment V. Telson smooth, subaculear tubercle absent. Chelicerae with two reduced denticles at the base of the movable finger, the distal denticle double the size of the basal one (cf. Vachon, 1963). Pedipalps: Trichobothrial pattern orthobothriotaxic, type A (cf. Vachon, 1974); dorsal trichobothria of femur in beta configuration (Vachon, 1975). Femur pentacarinat; all carinae strongly crenulate. Patella with 7 keels; all carinae moderate to strong; internal carinae with one spinoid granule distally. Tibia slender, with elongated fingers; all carinae weakly granular, almost vestigial. Dentate margin of movable and fixed fingers composed of 12 almost linear rows of granules. Legs: Ventral side of tarsi with numerous setae not arranged in straight rows. Strong patellar spurs present on legs III and IV, strong pedal spurs present on all legs. Measurements. See Table I.

ECOLOGY AND BIOGEOGRAPHY

Habitat: The area in which *Leiurus jordanensis* sp. n. was collected is composed of sandstone cliffs surrounded by flat sand fields, small sand dunes and xeric hammada with scattered *Haloxylon persicum* and *Anabasis* sp. bushes. The specimen was collected during the night (22:10h) sitting at the entrance of a very deep crevice in the zone between the vertical sandstone cliff and the surrounding sand dune. The habitat lies at the margin of extensive sand dunes, which penetrate from Saudi Arabia into Jordanian territory. Some psammophilous Arabian faunal elements, such as *Acanthodactylus tilburyi* (Reptilia, Lacertidae), reach at this place the NW boundary of their distribution (Modry *et al.*, 1999).

The habitat of *L. jordanensis* sp. n. seems to differ from the ecological requirements described for *L. quinquestriatus hebraeus* by Levy & Amitai (1980). In their

ecological notes these authors stated: "It is found on various types of soil: terra rossa, basalt, rendzina, loess and stony desert. It does not occur in the Coastal Plain, on Mount Carmel or in plains and valleys with sand dunes or heavy soil".

Geographical distribution: According to Fet & Lowe (2000), *Leiurus quinquestriatus* is distributed throughout Algeria, Chad, Egypt, Ethiopia, Libya, Mali, Niger, Somalia, Sudan, and Tunisia in Africa, and the Sinai Peninsula, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates and Yemen in Asia. The African populations correspond largely with the nominal subspecies, *L. quinquestriatus quinquestriatus*, whereas those in Asia belong to the nominal subspecies *L. quinquestriatus hebraeus*. According to Levy *et al.* (1970), the Isthmus of Suez is apparently the border between the two subspecies, but no intermediate population has been clearly defined. Moreover, in a map Levy & Amitai (1980: fig. 3) indicate the records for *Leiurus* in Israel and the Sinai Peninsula. Only a few localities are indicated in Jordan, all of which are situated very close to the border with Israel. In his studies on Saudi Arabian scorpions, Vachon (1979) merely indicated a number of localities for *L. quinquestriatus* in the central and western regions of the country. No localities were cited in the region closer to the Jordanian border.

The distribution of the new species therefore appears to be limited to an enclave within the area in which *Leiurus quinquestriatus* is distributed. In this enclave, other endemic elements are present. One example is the monotypic genus *Birulatus* Vachon, described on the basis of a single female specimen collected in the south of Tafila, close to Shauback, 30° 31' 60" N, 35° 34' 0" E (see Lourenço, 1999).

ACKNOWLEDGEMENTS

The field work of D.M. was supported in part by the Higher Council of Science & Technology/Badia Development and Research Project (Animal Biodiversity). We are grateful for the continuous support of Mohamed Shahbaz, director of the Badia project. We also appreciate the logistic support provided by Mutah University and we thank Ratib Al-Oran, Jan R. Slapeta, Lina Rifai, Martin Kamler and Mohammad Abu Baker for joining M. D. in the field. We are also grateful to D. Geffard, Muséum national d'Histoire naturelle, Paris for technical help with the illustrations and to Prof. J. L. Cloudsley-Thompson, London and Peter Schwendinger, Geneva for revising the manuscript.

REFERENCES

- BIRULA, A. A. 1908. Ergebnisse der mit Subvention aus der Erbschaft Treilt unternommenen zoologischen Forschungsreise Dr. F. Werner's nach dem Anglo-Aegyptischen Sudan und Nord-Uganda. XIV. Skorpiones und Solifugae. *Sitzungsberichte der kaiserlich-königlichen Akademie der Wissenschaften*, Wien, 117 (1): 121-152.
- BRAUNWALDER, M. E. & FET, V. 1998. On publications about scorpions (Arachnida, Scorpiones) by Hemprich and Ehrenberg (1828-1831). *Bulletin of the British Arachnological Society* 11 (1): 29-35.
- FET, V. 1997. Notes on the taxonomy of some old world scorpions (Scorpiones: Buthidae, Chactidae, Ischnuridae, Scorpionidae). *The Journal of Arachnology* 25: 245-250.

- FET, V. & LOWE, G. 2000. Family Buthidae C. L. Koch, 1837 (pp. 54-286). In: FET, V., SISSOM, W. D., LOWE, G. & BRAUNWALDER, M. E. (eds). Catalog of the Scorpions of the world (1758-1998). New York, NY: The New York Entomological Society.
- FRANCKE, O. F. 1985. Conspectus genericus scorpionum 1758-1982 (Arachnida: Scorpiones). *Occasional Papers of the Museum, Texas Tech University* 98: 1-32.
- HEMPRICH, F. W. & EHRENBERG, C. G. 1828. Zoologica II. Arachnoidea. Plate I: *Butlus*; plate II: *Androctonus*. In: Symbolae Physicae seu Icones et Descriptiones Animalium evertetorum sepositis Insectis quae ex itinere per Africam borealem et Asiam occidentalem. Friderici Guilelmi Hemprich et Christiani Godofredi Ehrenberg, medicinae et chirurgiae doctorum, studio novae aut illustratae redierunt. Percensuit et regis iussu et impensis edidit Dr. C. G. Ehrenberg. Decas prima. Berolini ex officina Academica, Venditur a Mittler.
- HEMPRICH, F. W. & EHRENBERG, C. G. 1829. Vorläufige Übersicht der in Nord-Afrika und West-Asien einheimischen Skorpione und deren geographischen Verbreitung. *Verhandlungen der Gesellschaft der naturforschender Freunde in Berlin* 1 (6): 348-362.
- KRAEPELIN, K. 1891. Revision der Skorpione. I. Die Familie der Androctonidae. *Jahrbuch der Hamburgischen wissenschaftlichen Anstalten* 8: 1-144.
- LEVY, G. & AMITAL, P. 1980. Fauna Palaestina, Arachnida I : Scorpiones. *Israel Academy of Sciences and Humanities, Jerusalem*, 130 pp.
- LEVY, G., AMITAL, P. & SHULOV, A. 1970. *Leiurus quinquestriatus hebraeus* (Birula, 1908) (Scorpiones; Buthidae) and its systematic position. *Israel Journal of Zoology* 19: 231-242.
- LOURENÇO, W. R. 1999. On the phylogenetic position of the genus *Birulatus* Vachon, 1973 (Scorpiones, Buthidae) and redescription of *Birulatus haasi*. *Zoology in the Middle East* 18: 109-113.
- MODRY, D., AL-ORAN, R. M., AMR, Z. S. & NECAS, P. 1999. A new record of the Tilbury's spiny-footed lizard, *Acanthodactylus tilburyi* Arnold, 1986 (Reptilia: Lacertidae), from the Hashemite Kingdom of Jordan. *Casopis Narodního muzea Rada přírodovědná* 168 (1-4): 121-124.
- SISSOM, W. D. 1990. Systematics, biogeography and paleontology. (pp. 64-160). In: POLIS, G. A. (ed). Biology of Scorpions. *Stanford University Press, Stanford, California*.
- SISSOM, W. D. 1994. Description of new and poorly known scorpions of Yemen (Scorpiones: Buthidae, Diplocentridae, Scorpionidae). *Fauna of Saudi Arabia* 14: 3-39.
- VACHON, M. 1949. Etude sur les Scorpions. III (suite). Description des Scorpions du Nord de l'Afrique. *Archives de l'Institut Pasteur d'Algérie* 27 (2): 134-169.
- VACHON, M. 1952. Etude sur les Scorpions. *Institut Pasteur d'Algérie, Alger*, 482 pp.
- VACHON, M. 1963. De l'utilité, en systématique, d'une nomenclature des dents des chélicères chez les Scorpions. *Bulletin du Muséum national d'Histoire naturelle*, 2e sér. 35 (2): 161-166.
- VACHON, M. 1966. Liste des Scorpions connus en Egypte, Arabie, Israël, Liban, Syrie, Jordanie, Turquie, Irak, Iran. *Toxicon* 4: 209-218.
- VACHON, M. 1974. Etude des caractères utilisés pour classer les familles et les genres de Scorpions (Arachnides). 1. La trichobothriotaxie en arachnologie. Sigles trichobothriaux et types de trichobothriotaxie chez les Scorpions. *Bulletin du Muséum national d'Histoire naturelle*, 3e sér. n° 140, Zool. 104: 857-958.
- VACHON, M. 1975. Sur l'utilisation de la trichobothriotaxie du bras des pédipalpes des Scorpions (Arachnides) dans le classement des genres de la famille des Buthidae Simon. *Comptes Rendus des Séances de l'Académie des Sciences* 281 (D): 1597-1599.
- VACHON, M. 1979. Arachnids of Saudi Arabia – Scorpiones. *Fauna of Saudi*.